Teaching Portfolio
Felicia Tabing
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List of Courses Taught

List of Courses Instructed:

Rose-Hulman Institute of Technology

Teaching duties were to teach 4-5 days a week for a 50 minute class period, write and grade exams and quizzes. These courses were instructed with a group of instructors, with a common final.

- Calculus II (MA 112): Fall 2015, Winter 2015-16
  - 20-25 students enrolled
- Discrete and Combinatorial Algebra (MA 275): Winter 2015-16
  - 25-30 students enrolled

University of California, Santa Cruz

Teaching duties were to teach 3 times a week for about 3 hours, write and grade exams, and supervise and coordinate the course with a teaching assistant and section.

  - 40-50 students enrolled

Listed of Courses Assisted:

University of California, Santa Cruz

Each section assisted consisted of 20-50 students. Teaching assistant duties were to run the discussion section, write quizzes, grade quizzes and exams, and grade homework when needed.

- Pre-Calculus (Math 3): Fall 2006
- Calculus for Science, Engineering, and Mathematics (Math 19A): Winter 2015, Spring 2015 (Online)
- Vector Calculus (Math 23A): Winter 2011
- Introduction to Problem Solving (Math 30): Fall 2011
- Introduction to Proofs and Problem solving (Math 100): Winter 2012 Winter 2013, Winter 2013, Fall 2013
- Algebra, Group Theory (Math 111A): Fall 2014
Syllabus Sample

The following is a syllabus used for Calculus II in Fall 2015 at Rose-Hulman. Most of my syllabi contain just about the same content, and I always include a rough schedule outline. I usually post my syllabus on the course website, or on a learning management system if I am using that.

**MA 112 Calc II, Fall 2015**

**Instructor:** Felicia Tabing  
**E-mail:** tabing@rose-hulman.edu  
**Office:** Crapo G216  
**Office Phone:** (812) 877-8109  
**Skype:** tabing@rose-hulman.edu

**Class Location:** Crapo G221  
**Class Meeting Times:** MTWRF, Section 05 (Period 7) and Section 06 (Period 8)  
**Office Hours:** 9th period MTWR, 10th period MW, by appointment, or whenever you can find me in my office and I’m not busy.

**Instructor schedule:**

<table>
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<tr>
<th>Day</th>
<th>Period</th>
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<td>MA1</td>
<td>12</td>
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<td>Office Hours</td>
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<td>Office Hours</td>
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Course Goals:

- Introduce students to integral calculus (including elementary first order differential equations).
- Introduce students to the application of integral calculus and differential equations in science and engineering.
- Introduce students to series of constants and functions, and the notions of approximation and convergence.
- Develop student mathematical modeling and problem solving skills.
- Develop student ability to use Maple to aid in the analysis of quantitative problems.
- Introduce applications of mathematics, especially to science and engineering.

Course Description

Techniques of integration, numerical integration, applications of integration. L'Hopital's rule and improper integrals. Separable first order differential equations, applications of separable first order differential equations. Series of constants, power series, Taylor polynomials, Taylor and McLaurin series. Prerequisites: MA111

Course Materials:


Supplement: Just in Time - bundled with text.

DE Problem supplement: 2013-14 version from Moodle

Computer Usage: Maple 2015 or later must be available on your laptop.

Computer/Calculator Usage

Please bring your laptop to every class. We may not always use it, but bring it just in case. If using the laptop in class, I expect you to be working, so I only want to see Maple or Moodle on your screen. I will not tolerate any work on the laptop not related to this course. Students will be expected to demonstrate a minimal level of competency with Maple. Maple will be an integral part of the course and will be used regularly in class work, in homework assignments and during quizzes/exams. You will also be expected to do work by hand.
**Grading:**

Your final grade will be computed as follows:

<table>
<thead>
<tr>
<th>%</th>
<th>Grade Letter</th>
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<tbody>
<tr>
<td>90,90+</td>
<td>A</td>
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<tr>
<td>[85,90)</td>
<td>B+</td>
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<td>[80,85)</td>
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<td>[75,80)</td>
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<td>[70,75)</td>
<td>C</td>
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<tr>
<td>[65,70)</td>
<td>D+</td>
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<tr>
<td>[60,65)</td>
<td>D</td>
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<tr>
<td>&lt;60</td>
<td>F</td>
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</table>

**Grade distribution:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Exams</td>
<td>10% × 3</td>
</tr>
<tr>
<td>Assignments/Projects</td>
<td>20%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Final</td>
<td>20%</td>
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I will adjust exam scores when necessary, only when the results will be in your favor. For the homework, only select problems may be graded. I will drop the lowest homework score.

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**Homework:**

Homework assignments will be announced in class and posted on the homework section in Moodle. Some homework will be turned in in class, and some will be submitted on Moodle. Homework will be turned in on the beginning of class on the due date. If you turn it in during or after class, it will be
considered late. I do not want you to be working on homework in class. Please put your full name, and your campus mailbox number on the top of the page. I expect homework to be neatly written, with problems presented in a logical manner. Clearly circle or highlight your answers. If you got help from someone or from a source online, include the source by your work. Multiple pages should be fastened in some way, preferably with a staple. The grader or I reserve the right to refuse an assignment if it is not clear enough to grade. If homework is turned in late, the penalty is 1/4 of your score is deducted if you turn it in late the same day, 1/2 deducted if you turn it in a day later, and 3/4 deducted if you turn it in two to four days after the deadline. After that, homework will only be accepted for exceptional cases.

Quizzes:

Expect a short, 15-20 minute quiz every week, except the weeks of an exam. Most quizzes will be held on Fridays at the end of class. They are no notes/closed book unless I mention otherwise. I will post the relevant topics and book sections covered on a quiz on the course schedule.

Exams

There will be three exams each held on a Friday. I allow one side of half of an 8.5" by 11" page of paper of notes during the exams. Note that you are not allowed any notes during the final. I will post the relevant topics and book sections covered on the exam on the course schedule.

Final

The final exam will consist of two parts. The first part will be "by hands" (paper, pencil). No computing devices (calculators/computers) will be allowed during the first part of the final exam. This part of the exam will cover both computational fundamentals as well as some conceptual interpretation, though the level of difficulty and depth of conceptual interpretation must take into account that this part of the exam will be shorter than the second part of the exam. The laptop, starting with a blank Maple work sheet, and a calculator, may be used during the second part of the exam. No "cheat sheets", prepared Maple worksheets or prepared program on the calculator may be used. The second part of the exams will cover all skills: concepts, calculation, modeling, problem solving, and interpretation.

No books or notes will be allowed on the final.

Readings:

Along with assigned problems, you will be expected to also read the text for homework. I will note on the schedule which sections you are expected to read. While reading, you are expected to also work through the examples yourself on scratch paper.
Extra Credit:

I may give out some extra credit assignments periodically. These will be added to your grade after any adjustments are made on your non-extra credit assignments. They will be credited to homework first, leftovers to assignments, then quizzes, and then exams last. All extra credit problems are listed in a PDF file in Moodle under "Assignments."

Attendance:

I expect attendance at every class meeting, with the exception of a few cases, such as illness or a family emergency. A valid excuse for an absence consists of a letter from the Dean of Students or the doctor. Letters should be provided within a week of the illness/circumstance. Professional activities, such as job interviews, conferences, institute-sponsored activities, are valid excuses provided that every attempt to avoid missing major assignments has been made, and the student notifies me in writing at least one week in advance of the event.

Participation:

I expect students to fully participate in class. I expect everyone to be patient with each other, be respectful in classroom discussions. If you find yourself dominating a discussion, please practice self-monitoring to let other speak. Sleeping and doing work for other classes is not permitted. Cell phones must be silent, no texting, and no browsing the internet while using your laptop. Only use of a computer calculator, such as Maple, is permitted in class.

Office Hours:

I hope to see every student at least once in office hours. I have designated office hours, but if you find me in my office with the door open, feel free to stop by. My office hours are for you, so be sure to take advantage of them. I am available for you to ask me questions, and help you with anything in this course that you find confusing. If you would like to stop by outside my designated office hours or would like to make an appointment, e-mail or call me.

Academic Integrity:

I expect you to turn in your original work, in your own words. You are highly encouraged to collaborate, but write up your own assignments. If you collaborate on a problem, cite the name of the person you worked with. If I find evidence of academic misconduct, involved students will receive a zero on relevant work.
RHIT’s Code of Ethics states that “Rose-Hulman expects its students to be responsible adults and to behave at all times with honor and integrity.” Academic misconduct, including but not limited to cheating and plagiarizing/copying (from any source) on homework, quizzes, and exams, will be reported to the Dean of Students and result in a penalty ranging from a zero on the assignment to failure of the course.


Accommodations:
Disability Services determines classroom accommodations based on documented disabilities. Contact Disability Services at 812-877-8285 or by e-mail at disabilityservices@rose-hulman.edu. If you qualify for and choose to use classroom accommodations because of a disability, you must notify me as soon as possible.

Resources:
Maple:
Tutorials:

Tutoring:

Small print: I reserve the right to change any part of the syllabus and schedule at any time.
Sample Assignments

Below are assignments and worksheets I gave in Calculus II. I try to make my assignments fun and interesting, or explain some sort of phenomena. The assignments are listed below, with a description

- **Area of a Leaf project** (Page 11-12): I assigned this to my students the second time I taught calculus. I thought it was a fun way of getting them out and using modeling and function fitting techniques. When I gave this assignment to my students at Rose-Hulman, and because Maple is integrated into the course, I had my students use their data from the leaf trace and have Maple fit a curve. My students had a lot of fun with this project, and I was very surprised at how innovative they were in fitting the curves.

- **Spring Work Activity** (Pages 13-14): When we reached the topic of using an integral to calculate work, I did a hands-on activity where I brought various springs, such as traditional springs and rubber bands, and various objects as weights, and had them measure the spring constant and calculate the work done on the spring in pulling it by hanging a mug from it.

- **Taylor Series Applications Activity** (Pages 15-19): For Fall 2015, the other instructors and I agreed to teach Calculus II by introducing series and sequences first, instead of at the end of the course, like it is usually taught. The reason they did this was because many of the students have a pretty strong Calculus background, and it was to level everyone out at the start of the course because a lot of them have not seen series before. A lot of students thought this section was difficult, and often ask “why do I need to know this?” so I thought it was helpful to have a worksheet that walks them through different applications of a Taylor series.

- **Gabriel’s Horn** (Pages 20-21): When I learned about Gabriel’s horn, I thought it was a fun paradox, so I shared it with my students as an assignment. I thought I would also ask them for a reaction, and many of my students thought it was fun to think about. I got comments saying, “It’s mindblowing,” or “I trust the mathematics but my brain can’t wrap around this.”
Surface Area of a Leaf Project
Due Monday, 10/26

The goal is to approximate, as accurately as possible, the surface area of a leaf. You may work by yourself or in pairs. If you work with a partner, turn in one assignment with both of your names on it.

Instructions:

- Pick 2-3 leaves from a plant, each from a different plant.
- On graph paper, trace the outline of the leaf.
- Remove the leaf away from the outline, and paste it elsewhere on your graph paper.
- On the leaf outline, draw an $x$- and $y$-axis. Make sure to line up the axes so that they are aligned with the units on the graph paper.
- Find explicit functions that model the shape of the curves. Note that you may require more than two curves. You can try fitting it with any curve you know of (polynomials, sine, cosine, etc.), or you can use Maple:
  - You can use Maple to help you find functions that model curves. First, pick several points from your curve, the more samplings you take, the better.
  - Write your points like this: $[[1,2],[2,3],[3,3.25]]$. Make sure to make your units small enough.
  - Use the curvefitting command: CurveFitting[Interactive]([[1,2],[2,3],[3,3.25]])
A window like this should pop up:

In the “Enter an expression in x:” box, put the degree of polynomial you would like. For example, a*x^3+b*x^2+c*x+d then click the “plot button” next to it. (The higher degree of a polynomial you use, the better it fits the data.) You should get something like this:

The polynomial circled in red above is the curve that fits your data.

When you click “Done,” Maple will return the polynomial curve.

- After you have successfully fitted the outlines of your leaf with curves, use an integral to find the area between curves to get the surface area of your leaf. Your answer should include units.
- Make sure to glue or tape your leaf to the assignment when you turn it in. No credit will be given unless you include the leaves.
- Include a paragraph or so explaining your methods of calculating the leaf area.
- Find the surface area for two leaves. You may do more of them if you want to, but extra credit won’t be given for any extra that you do.
Calculate the Spring Constant and Work in Stretching a Spring

Name and Mailbox Number:

**Hooke’s Law**: The force required to hold a stretched or compressed spring \( x \) units from its natural length is proportional to \( x \).

\[ F = kx \]

Here, \( k \) is the **spring constant**, with units in force/length.

We will calculate a spring’s spring constant, and find the work required to stretch a spring from its natural length with a certain force holding the spring stretched past its natural length.

**Calculate the Spring Constant:**

Name of the spring you are investigating:

Name of the mass you are using:

The natural length of the spring is: _____________ (units in meters or feet)

The weight of the mass is: _____________________ (units in kg·m/s\(^2\) or lbs)

The length of the stretched spring is: _______________ (units in meters or feet)

The difference in the length of the stretched spring and the natural length is: _______________

The spring constant \( k = \) ________________.

**Calculate work done in stretching the spring with a mug:**

Using the same spring as above, calculate the work done in stretching the spring with a mug.

Name of mug you are using: _______________

The weight of the mug: _____________________

The length of the spring with the mug hanging from it: _________________

The difference in the length of the spring with the mug and the natural length: ________________

\[ W = \int_a^b Fdx \]

\[ a = \] ________________, \( b = \) ________________, \( F = \) ________________

Calculate work: _______________________ (put your answer here)
Try another spring:

**Calculate the Spring Constant:**

Name of the spring you are investigating:

Name of the mass you are using:

The natural length of the spring is: _____________ (units in meters or feet)

The weight of the mass is: _____________________(units in kg·m/s² or lbs)

The length of the stretched spring is: _____________(units in meters or feet)

The difference in the length of the stretched spring and the natural length is: _______________

The spring constant \( k = \) _______________

**Calculate work done in stretching the spring with a mug:**

Using the same spring as above, calculate the work done in stretching the spring with a mug.

Name of mug you are using: _______________

The weight of the mug: _____________________

The length of the spring with the mug hanging from it: _______________________

The difference in the length of the spring with the mug and the natural length: _______________

\[
W = \int_a^b Fdx
\]

\( a = \) _______________, \( b = \) _______________, \( F = \) _______________

Calculate work: _________________________ (put your answer here)
Sample exams and projects (graded)

Included below is a graded exam from a student from integral calculus. I also attached a project prompt for finding volumes of objects using calculus techniques, and I include a project from students. I graded their project with a rubric.
Applications of Taylor Series

Names:

Using Taylor Polynomials to Help with Estimation

Taylor polynomials are very useful in that they give a nice systematic way of estimating various quantities.

Estimate $\sqrt{\frac{1}{2}}$

Use Maple to make your computations quicker, although I encourage you to make sure you know how to do this ”by hand.”

1. Try to find the Taylor Series for $f(x) = \sqrt{x}$ about $x = 0$. What happens?

2. Now find the Taylor Series for $f(x)$ about $x = 1$.

3. Write the Taylor Polynomial $P_n(x)$ for $f(x)$.
4. What is $P_3(\frac{1}{2})$? $P_4(\frac{1}{2})$? $P_5(\frac{1}{2})$? $P_6(\frac{1}{2})$?

5. Using Maple or a calculator, what is $\sqrt{\frac{1}{2}}$ up to 10 decimal places?

6. Compare the difference of the approximate value of $\sqrt{\frac{1}{2}}$ in 5. compared to the values in 4. How different are they?

7. Graph $f(x) = \sqrt{x}$ and $P_1$, $P_2$, $P_3$, $P_4$ on Maple. Reproduce a sketch below.
More estimation.

1. Find the Taylor Series for $ln(1 + x)$ about $x = 0$.

2. Write out the series for $ln(2)$. Does it look familiar?

3. Take the derivative of both sides of your result from (1). What do you get?
Using Taylor Series in Determining Limits

Taylor Series are often very helpful in determining limits, especially since simplifying an expression with powers of $x$ in it is usually easier than with just any old function.

Determine the following:

$$\lim_{n \to 0} \frac{\sin(x) - x}{x^3}$$

1. Replace $\sin(x)$ in the limit above with its Taylor series about $x = 0$. Simplify the expression. What is the limit?

2. Use L’Hospital’s Rule.

Even though in this case you could have used L’Hospital’s Rule, this gives you an idea about how it can be used in determining limits.
Complex Analysis

Below demonstrates an interesting equality from complex analysis. Recall that the imaginary number \( i = \sqrt{-1} \).

1. Recall the Taylor series for \( e^x \) about \( x = 0 \). Replace every \( x \) with \( ix \) to get a new series for \( e^{ix} \). What is this series?

2. Recall the Taylor series for both \( \sin(x) \) and \( \cos(x) \). Write out the sum of the Taylor series for \( \cos(x) + i\sin(x) \).

3. Compare what you got in 1. and 2. If you rearrange, you should get \( e^{ix} = \cos(x) + i\sin(x) \).
Consider the surface revolution given by rotating $y = \frac{1}{x}$ about the $x$-axis from 1 to $\infty$.

1. Show that the surface area is infinite.
   
   (a) Set up the integral that computes the surface area.

   (b) Show that this integral diverges.
2. Show that the volume of the solid of revolution given by rotating the region bounded by \( y = \frac{1}{x} \), the \( x \)-axis, and \( x = 1 \) to \( \infty \).

   (a) Set up the integral that computes the volume.

   (b) Show that the volume is finite.

3. What do you make of this? This is considered a paradox because this is an object that you can fill with a finite amount of paint, yet you cannot paint the surface with a finite amount of paint.
MA 112 Exam 1

Show all of your work, and make sure to cite which theorems you are using. You are allowed one side of an 8.5" by 11" page of notes. No calculators, or laptops allowed. **Put your name and mailbox number on the last page only.** Do not put your name anywhere else on the exam.

1. (15 points) Circle **True** or **False**.
   - A series must converge if its sequence of partial sums converges.  **(True or False)**
   - If \( a_n \) is a sequence such that \(-1 \leq a_n \leq 1\) for all \( n \) (that is, all terms in the sequence between \(-1\) and \(1\)) then \( a_n \) must converge.  **(True or False)**
   - If \( \lim_{k \to \infty} c_k = 0 \) then \( \sum_{k=1}^{\infty} c_k \) converges.  **(True or False)**  \( c_k = \frac{1}{n} \)
   - A power series \( \sum_{k=1}^{\infty} a_k x^k \) always converges for every real number \( x \).  **(True or False)**  \(|x| < 1\)
   - A series which converges absolutely must converge.  **(True or False)**
2. Determine whether the following sequences converge or diverge. If they converge, find their limit. Justify your answers.

(a) (10 points) \( a_n = \frac{n^2}{n^3 + 1} \).

**Solution**

\[
\lim_{n \to \infty} a_n = \lim_{n \to \infty} \frac{n^2}{n^3 + 1} = \lim_{n \to \infty} \frac{n^2}{n^3} = \frac{1}{n}
\]

When \( n \to \infty \), \( \lim_{n \to \infty} a_n = 0 \).

So, \( a_n \) converges to 0.

\[
\lim_{n \to \infty} a_n = \lim_{n \to \infty} \frac{n}{1} = \lim_{n \to \infty} \frac{2n}{3n} = \frac{2}{3}.
\]

(b) (10 points) \( a_n = \frac{2^n - 1}{3^n} \).

**Solution**

\[
\lim_{n \to \infty} a_n = \lim_{n \to \infty} \frac{2^n - 1}{3^n} = \frac{2^n}{3^n} - \frac{1}{3^n} = (\frac{2}{3})^n.
\]

When \( n \to \infty \), \( a_n \) diverges.

\[
\lim_{n \to \infty} \frac{2^n - 1}{3^n} = \lim_{n \to \infty} \left( (\frac{2}{3})^n \cdot \frac{1}{3^n} \right)
\]

\[
\therefore \frac{2}{3} < 1
\]

\[
\therefore \lim_{n \to \infty} \frac{2^n - 1}{3^n} = 0
\]

The sequence also converges to 0.
3. Determine whether or not the following series converges or diverges. State the name of the tests you use, and how you can conclude convergence or divergence from the test.

(a) (10 points) \( \sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} \)

Solution: \( \sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} = \sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} \).

Use p-series test.

\[ p = \frac{1}{2} \leq 1 \]  

\[ \therefore \text{diverges}. \]

(b) (10 points) \( \sum_{n=1}^{\infty} \frac{e^n}{n^2} \)

Solution

Use the comparison test.

Compare \( \sum \frac{e^n}{n^2} \) to \( \sum \frac{1}{n^{1/2}} \).

\[ \lim_{n \to \infty} \frac{e^n}{n^2} = \lim_{n \to \infty} \frac{e^n}{n^2} \]

\[ \therefore \text{diverges}. \]
4. Consider the power series \( \sum_{n=0}^{\infty} \frac{\sqrt{n} x^n}{2^n} \)

(a) (15 points) For what values of \( x \) does this series converge absolutely?

Solution: If \( \left| \sum_{n=0}^{\infty} \frac{\sqrt{n} x^n}{2^n} \right| \) converges, then \( \sum_{n=0}^{\infty} \frac{\sqrt{n} x^n}{2^n} \) converges absolutely.

Use Ratio Test:
\[
\lim_{n \to \infty} \left| \frac{\frac{\sqrt{n+1} x^{n+1}}{2^{n+1}}}{\frac{\sqrt{n} x^n}{2^n}} \right| = \lim_{n \to \infty} \left| \frac{\sqrt{n+1} x^{n+1}}{2^{n+1}} \cdot \frac{2^n}{\sqrt{n} x^n} \right| = \lim_{n \to \infty} \left| \frac{\sqrt{n+1} x}{2} \right| = \frac{|x|}{2} < 1.
\]

\( |x| < 2 \)
\( \Rightarrow x \in (-2, 2) \).

(b) (10 points) For what values of \( x \) does this series converge conditionally?

Solution: If \( \lim_{n \to \infty} \left| \frac{a_n}{a_{n+1}} \right| > 1 \), then the series will diverge.

\( \therefore x \in (-\infty, -2) \cup (2, +\infty) \).

\( \therefore x \in \{-2\} \cup \{2\} \).

(c) (5 points) What is the interval of convergence?

Solution: The interval is 4.

\( -2 < x < 2 \).

When \( x = \pm 2 \), \( \sum_{n=0}^{\infty} \frac{\sqrt{n} x^n}{2^n} \) conditionally converges.
5. (a) (10 points) Find the Taylor polynomial of degree 3 about $x = 1$ for $f(x) = \ln(x)$.

Solution. \[
P_{3}(x) = f(1) + f'(1)(x-1) + \frac{f''(1)}{2!}(x-1)^2 + \frac{f'''(1)}{3!}(x-1)^3 + \cdots
\]

\[
= \ln(1) + (x-1) + \left(-\frac{1}{2}ight)(x-1)^2 + \frac{1}{3}(x-1)^3 + \cdots
\]

\[
P_{3}(x) = \frac{1}{3}(x-1)^3.
\]

(b) (5 points) Use the Taylor polynomial above to give an estimate of $\ln(1.5)$. (No need to simplify).

Solution when $x = \frac{3}{2}$.

\[
P_{n}\left(\frac{3}{2}\right) = \ln(1) + \frac{3}{2} - 1 - \frac{1}{3}\left(\frac{3}{2} - 1\right)^2 + \frac{1}{3}\left(\frac{3}{2} - 1\right)^3 + \cdots
\]

\[
= \ln(1) + \frac{1}{2} - \frac{1}{8} + \frac{1}{24} + \cdots
\]

\[
\ln(1.5) \approx P_{n}\left(\frac{3}{2}\right) = \frac{1}{2} - \frac{1}{8} + \frac{1}{24} \approx \ln(1.5)
\]

(c) (Extra Credit) (5 points) Find the Taylor series for $f(x)$ about $x = 1$.

Solution \[
g(x) = f(x) + f'(x)(x-1) + \frac{f''(x)}{2!}(x-1)^2 + \frac{f'''(x)}{3!}(x-1)^3 + \cdots + \frac{f^{(n)}(x)}{n!}(x-1)^n
\]

\[
f^{(n)}(x) = (-1)^n \cdot (n-1)! \cdot x^{n-1}
\]

\[
f^{(n)}(1) = (-1)^{n-1} (n-1)!
\]

\[
\therefore f(x) = \sum_{n=0}^{\infty} \frac{(-1)^{n-1}}{n!} (n-1)! (x-1)^n.
\]

\[
= \sum \frac{(-1)^{n-1} (x-1)^n}{n!}
\]
Scratch work:

\[ \frac{\frac{e^n}{n^2}}{\frac{1}{n^2}} = \frac{e^n}{n^2} \rightarrow \infty \text{ changes} \]

\[ \frac{e^{n+1}}{(n+1)^2} = \frac{e^n}{(n+1)^2} \]

\[ \frac{e^n}{n^2} = e \]

\[ \sum_{n=0}^{\infty} \frac{x^n}{2^n} - \frac{\sqrt{n+1} \cdot x^{n+1}}{2^{n+1}} = \frac{x\sqrt{n+1}}{2\sqrt{n}}. \]
1. (15 points) .................. 15
2. (20 points) .................. 10
3. (20 points) .................. -20
4. (30 points) .................. 17
5. (15 points) .................. 10

Total (100 points) .................. 78
Name: [redacted]
Mailbox number: 2236
Volume of a Solid Project

This project will be worth 50 points. Choose from one of the options listed below. You can submit a project as a group of two, or individually. I may allow you to work in groups of more than two, depending on how complicated a project is. If you want to work on a more complicated project with a larger group, come see me for approval.

Due Monday, 11/2

Estimate the volume of a body

Estimate the volume of an entire body. This could be you, a friend, or a large animal. You must use the cross-section method, disk/washer method, cylindrical shells, or any combinations of these methods, to create your estimate.

Suggestions on how to obtain your measurements: For example, if you wanted to obtain the volume of a thigh, you can possibly assume it is part of a cone, and use measuring tape to take measurements along even intervals along the thigh, and use a disk/cylinder method to estimate the volume. You can also try to model body parts as solids given by rotations or areas.

You must submit:

- A write-up of your methods of estimating the volume. Write a description on how you obtained your measurements, and how you made your calculations.
- Draw a diagram or take a photo of the person’s/animal’s body, along with several measurements. Label the diagram with descriptions of how you measured body parts. You may want to include several photos or diagrams.
- Bonus points will be given for exceptionally detailed measurements and calculations. Bonus points will also be given if you found another method of verifying how close your estimate is, for example, placing the body in a tub of water, or any other method.

Estimate the volume of material used in a sculpture on campus, or in Terre Haute

Estimate the volume of material used in any sculpture on campus or in Terre Haute. The sculpture must be “complicated,” nothing too easy like a cylinder. Check with me for approval. You must use the cross-section method, disk/washer method, cylindrical shells, or any combinations of these methods, to create your estimate.

Keep in mind whether or not the sculpture is solid or hollow, as I want you to find the actual volume of material used. For example, if the sculpture is made with some sort of metal or concrete, how much of that material was used? If the sculpture uses a variety of materials, I want you to list the volumes of each different material. If you are not sure whether or not the sculpture is solid or hollow, make calculations for each case.

You must submit:

- A write-up of your methods of estimating the volume. Write a description on how you obtained your measurements, and how you made your calculations.
• Include several photos of the sculpture, with labels of descriptions on how different parts were measured.
• Bonus points will be given for exceptionally detailed measurements and calculations. Bonus points will also be given if you found another method of verifying how close your estimate is, for example, if you can find a source that stated the amount of material used.

Estimate the volume of a tree

Estimate the volume of a tree. You should at the very least, estimate the volume of a tree’s trunk, along with several main branches. You must use the cross-section method, disk/washer method, cylindrical shells, or any combinations of these methods, to create your estimate.

You must submit:

• A write-up of your methods of estimating the volume. Write a description on how you obtained your measurements, and how you made your calculations.
• Include several photos and diagrams of the tree, with labels of descriptions on how different parts were measured.
• Bonus points will be given for exceptionally detailed measurements and calculations, for example, calculating the volume of smaller branches, and including leaves.

Estimate the volume of water that the Rose-Hulman or Terre Haute water tank holds

Estimate the volume of water that the Rose-Hulman water tank, or the Terre Haute water tank holds. You must use the cross-section method, disk/washer method, cylindrical shells, or any combinations of these methods, to create your estimate.

You must submit:

• A write-up of your methods of estimating the volume. Write a description on how you obtained your measurements, and how you made your calculations. For this project, it is fine to do some research and use measurements obtained from another source.
• Include several photos and diagrams of the tank, with labels of descriptions on how different parts were measured.
• Bonus points will be given for exceptionally detailed measurements and calculations. Bonus points will also be given if you found another method of verifying how close your estimate is, for example, if you can find a source that stated the amount of water it actually holds.

Estimate the volume of ivory in the elephant tusk in the SRC

Estimate the volume of the elephant tusk in the SRC. You must use the cross-section method, disk/washer method, cylindrical shells, or any combinations of these methods, to create your estimate.

You must submit:

• A write-up of your methods of estimating the volume. Write a description on how you obtained your measurements, and how you made your calculations. For this project, it is fine to do some research and use measurements obtained from another source.
• Include several photos and diagrams of the tusk, with labels of descriptions on how different parts were measured.
• Bonus points will be given for exceptionally detailed measurements and calculations. Bonus points will also be given if you found another method of verifying how close your estimate is, for example, placing the tusk in a tub of water (although you may not be allowed to do this).

Estimate the volume of water in one of the Rose-Hulman ponds or lakes

Estimate the volume of water in one of the Rose-Hulman ponds/lakes. You may want to get a boat to make your depth/length measurements. You can use any method that you can think of to estimate the volume, but you must make the measurements yourself.

You must submit:

• A write-up of your methods of estimating the volume. Write a description on how you obtained your measurements, and how you made your calculations. For this project, it is fine to do some research and use measurements obtained from another source
• Include several photos of the lake, with labels of descriptions on how different parts were measured.
• Bonus points will be given for exceptionally detailed measurements and calculations. Bonus points will also be given if you found another method of verifying how close your estimate is, for example, if you can find a source that stated the amount of water it actually holds.

Estimate the volume of ________________________________

This one is open-ended. If you have something you would like to estimate the volume of an object not listed above, come see me for approval.

You must submit:

• A write-up of your methods of estimating the volume. Write a description on how you obtained your measurements, and how you made your calculations. For this project, it is fine to do some research and use measurements obtained from another source
• Include several photos of the object, with labels of descriptions on how different parts were measured.
• Bonus points will be given for exceptionally detailed measurements and calculations. Bonus points will also be given if you found another method of verifying how close your estimate is.
<table>
<thead>
<tr>
<th>Criteria</th>
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<td>Used cross-section, disk/washer method, or cylindrical shell method</td>
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<td>Diagram contains labels and descriptions.</td>
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<td>An attempt was made to make a reasonably accurate estimate.</td>
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(for picking a difficult object)

Total

5

nice! I like how you tried this! That was really ambitious.
Volume of a Solid Project

Our strategy to find the volume of our sculpture, the ISU Rose by Patrick Titzer, was to divide the shape into different areas and volumes. First, we tackled the main body, the curves. The measurements we took included the height and base width of the main body; we soon realized that these measurements would not be enough. We then measured the amplitudes of the two theoretical curves as well as the offsets of these amplitudes and how far away they are from the base. After that, we then figured out possible points by laying the points along the x-axis and made the two sides into curves. We then plotted these points into Maple and found the possible Spinal Curves. Next, we took the area in between the curves and found the whole volume. Then we calculated the hollow space by subtracting out the volume of the shelled out section and small circular cut out at the bottom. Next, we had to find the volume of the spirals; we had to do some research about spirals. After a long time, we figured out a function to find the length of the spiral, from there we took the integral of the width with respect to length and multiplied by thickness. Afterwards, we took the volume of the base (a rectangular solid), and the 4 legs of the sculpture. These parts were basic and could be found doing basic geometry and algebra. Finally, we added up all our values and found our total area.
First, we calculated a curve fit for the top curve of the statue.

\[
\begin{align*}
&\text{CurveFitting}[]\{(0, 0), (14, 1), (44, -23), (94, -1.5), (132, -21.9), (162, -5.9), (173, -16.9)\} \\
&\quad \text{with parameters} \quad 0.27999653474699 x + 0.0134629451114 10^{-16} x^2 - 0.0010641228675823 x^3 \\
&\quad \text{result} \quad x < 14 \quad 5.83990629729163 - 0.345707652636688 x - 0.0446931604384565 (x - 14)^2 + 0.00098502673130424 (x - 14)^3 \quad x < 44 \quad -6.81723993316704 - 0.36779001518931 x + 0.0435670801432817 (x - 44)^2 - 0.0005602562258001 (x - 44)^3 \\
&\quad \text{otherwise} \quad x > 14 \quad x > 44 \quad x > 94 \quad x > 132 \quad x > 162 \quad x > 162
\end{align*}
\]

(1)

Next, we calculated a curve fit for the bottom curve of the statue.

\[
\begin{align*}
&\text{CurveFitting}[]\{(0, -47), (14, -41), (44, -48), (94, -21), (132, -36), (162, -11.9), (173, -16.9)\} \\
&\quad \text{with parameters} \quad -0.47 + 0.58419244411738 x + 2.37904933848248 10^{-12} x^2 - 0.0007971532597387132 x^3 \\
&\quad \text{result} \quad x < 14 \quad -42.6250611564713 + 0.16075796890809 x - 0.0334816746229235 (x - 14)^2 + 0.00072782360515071 (x - 14)^3 \quad x < 44 \quad -51.1811406398679 + 0.07298659060883 x + 0.03022236234329 (x - 44)^2 - 0.00043538199831092 (x - 44)^3 \quad x < 94 \quad -9.18240149952097 - 0.12571913293819 x + 0.35982792301231 (x - 94)^2 + 0.00070651523497323 (x - 94)^3 \\
&\quad \text{otherwise} \quad x > 14 \quad x > 44 \quad x > 94 \quad x > 132 \quad x > 162 \quad x > 162
\end{align*}
\]

(2)

Then we subtracted the top curve from the bottom curve and set that to the variable \( f \).

\[
\begin{align*}
&f := \begin{pmatrix}
0.27999653474699 x + 0.0134629451114 10^{-16} x^2 - 0.0010641228675823 x^3 \\
-5.83990629729163 - 0.345707652636688 x - 0.0446931604384565 (x - 14)^2 + 0.00098502673130424 (x - 14)^3 \\
-0.47 + 0.58419244411738 x + 2.37904933848248 10^{-12} x^2 - 0.0007971532597387132 x^3 \\
-42.6250611564713 + 0.16075796890809 x - 0.0334816746229235 (x - 14)^2 + 0.00072782360515071 (x - 14)^3 \\
-51.1811406398679 + 0.07298659060883 x + 0.03022236234329 (x - 44)^2 - 0.00043538199831092 (x - 44)^3 \\
-9.18240149952097 - 0.12571913293819 x + 0.35982792301231 (x - 94)^2 + 0.00070651523497323 (x - 94)^3 \\
-55.6654125453768 + 0.2557987599821 x + 0.051311828598339 (x - 132)^2 - 0.0014020223492322 (x - 132)^3 \\
-9.3633747170188 + 0.34573847098627 x + 0.057273444086638 x^3 \\
-67.1542249158595 - 0.04595205653544 x - 0.0748701814072563 (x - 162)^2 + 0.00226879336506837 (x - 162)^3
\end{pmatrix}
\end{align*}
\]

(3)

We then calculated a curve fit for the cutout on the bottom of the statue and set that to the variable \( g \).

\[
\begin{align*}
&\text{CurveFitting}[]\{(10, 0), (23, 5), (15, 1), (47, 0)\} \\
&\quad \text{with parameters} \quad 0.27999653474699 x + 0.0134629451114 10^{-16} x^2 - 0.0010641228675823 x^3 \\
&\quad \text{result} \quad x < 14 \quad -42.6250611564713 + 0.16075796890809 x - 0.0334816746229235 (x - 14)^2 + 0.00072782360515071 (x - 14)^3 \quad x < 44 \quad -51.1811406398679 + 0.07298659060883 x + 0.03022236234329 (x - 44)^2 - 0.00043538199831092 (x - 44)^3 \quad x < 94 \quad -9.18240149952097 - 0.12571913293819 x + 0.35982792301231 (x - 94)^2 + 0.00070651523497323 (x - 94)^3 \\
&\quad \text{otherwise} \quad x > 14 \quad x > 44 \quad x > 94 \quad x > 132 \quad x > 162 \quad x > 162
\end{align*}
\]
For finding the volume of the side of the statue, we used cross sections by plugging \( f \) into an integral from 0 to 173 to give us the surface area, and then multiplied the integral by the width (23.5) to give us the volume of the main body of the statue in cubic centimeters. We then set that value to the variable \( h \).

\[
\int_0^{173} f \, dx = 86274.21168
\]

\[
h := 86274.21168
\]  

For finding the volume of the cutout, we used cross sections by plugging \( g \) into an integral from 0 to 47 to give us the surface area, and then multiplied the integral by the width (23.5) to give us the volume of the cutout in cubic centimeters. We then set that value to the variable \( i \).

\[
\int_0^{47} g \, dx = 1104.50000
\]

\[
i := 1104.50000
\]

To get the total solid volume, we subtracted the volume of the cutout from the total solid volume to get the actual solid volume, and we set this value to the variable \( j \).

\[
h - i = 85169.71168
\]

\[
j := 85169.71168
\]

To find the internal volume subtracted for the hollowed out part of the statue, we took each point on the top and bottom curves and subtracted .5 (the wall thickness) from each point on the top curve and added .5 to each point on the bottom curve. We set these two curves equal to variables \( k \) and \( l \) respectively.

\[
CurveFitting\_Interactive\([(\{0,-5\},\{14.5\},\{44,-23.5\},\{94,-2\},\{132,-22.4\},\{162,-6.4\},\{173,-17.4\})\]

\[
-0.5 + 0.279966534746999 \times x + 0.0134624951114 \times 10^{-16} x^2
\]

\[
x < 14
\]

\[
5.33990629729163 - 0.345707592663688 \times x - 0.0446931604384565 \times x^2 - 0.000985002673130424 \times x^3
\]

\[
x > 44
\]

\[
-k := -7.31723993316704 - 0.367790001518931 \times x + 0.0439570801432817 \times x^2 - 0.00056002560228051 \times x^3
\]

\[
x < 44
\]

\[
14.193756387865 - 0.17227400142623 \times x + 0.0400467601954275 \times x^2 - 0.0008139126239135 \times x^3
\]

\[
x > 94
\]

\[
-56.1654125453768 + 0.255798379898218 \times x + 0.0513118281598339 \times x^2 - 0.001402023249232 \times x^3
\]

\[
x < 132
\]

\[
66.6542249158595 - 0.450952006563454 \times x - 0.0748701810472563 \times x^2 - 0.0022687933650683 \times x^3
\]

\[
otherwise
\]

\[
-k := -5.33990629729163 - 0.345707592663688 \times x - 0.0446931604384565 \times x^2 - 0.000985002673130424 \times x^3
\]

\[
x < 14
\]

\[
5.33990629729163 - 0.345707592663688 \times x - 0.0446931604384565 \times x^2 - 0.000985002673130424 \times x^3
\]

\[
x > 44
\]

\[
-k := -7.31723993316704 - 0.367790001518931 \times x + 0.0439570801432817 \times x^2 - 0.00056002560228051 \times x^3
\]

\[
x < 44
\]

\[
14.193756387865 - 0.17227400142623 \times x + 0.0400467601954275 \times x^2 - 0.0008139126239135 \times x^3
\]

\[
x > 94
\]

\[
-56.1654125453768 + 0.255798379898218 \times x + 0.0513118281598339 \times x^2 - 0.001402023249232 \times x^3
\]

\[
x < 132
\]

\[
66.6542249158595 - 0.450952006563454 \times x - 0.0748701810472563 \times x^2 - 0.0022687933650683 \times x^3
\]

\[
otherwise
\]

\[
CurveFitting\_Interactive\([(\{0,-0.5\},\{14,-40.5\},\{44,-47.5\},\{94,-20.5\},\{132,-35.5\},\{162,-11.4\},\{173,-16.4\})\]

\[
-0.5 + 0.279966534746999 \times x + 0.0134624951114 \times 10^{-16} x^2
\]

\[
x < 14
\]

\[
5.33990629729163 - 0.345707592663688 \times x - 0.0446931604384565 \times x^2 - 0.000985002673130424 \times x^3
\]

\[
x > 44
\]

\[
-k := -7.31723993316704 - 0.367790001518931 \times x + 0.0439570801432817 \times x^2 - 0.00056002560228051 \times x^3
\]

\[
x < 44
\]

\[
14.193756387865 - 0.17227400142623 \times x + 0.0400467601954275 \times x^2 - 0.0008139126239135 \times x^3
\]

\[
x > 94
\]

\[
-56.1654125453768 + 0.255798379898218 \times x + 0.0513118281598339 \times x^2 - 0.001402023249232 \times x^3
\]

\[
x < 132
\]

\[
66.6542249158595 - 0.450952006563454 \times x - 0.0748701810472563 \times x^2 - 0.0022687933650683 \times x^3
\]

\[
otherwise
\]
\[
\begin{align*}
\begin{bmatrix}
-6.5 - 2.7614412179752 x - 5.6304167674187 \times 10^{-15} x^2 + 0.00169817749679 x^3 & x < 14 \\
-15.8195981033987 - 1.76288584975724 x + 0.013123458729493 (x - 14)^2 - 0.00067794569738416 (x - 14)^3 & x = 14 \\
-77.686943464348 + 0.66068053325996 x + 0.0010383418964918 (x - 14)^2 + 0.000255209365020235 (x - 14)^3 & x = 44 \\
4.65000932879888 + 0.26753201476584 x - 0.0293807669925434 (x - 44)^2 + 0.00068510976529679 (x - 44)^3 & x = 94 \\
-97.1921829507318 + 0.467365022354028 x + 0.0487207205212438 (x - 94)^2 - 0.00125072588506445 (x - 132)^2 & x = 132 \\
-16.616032362501 + 0.0136483477546303 x - 0.063844609404557 (x - 162)^2 + 0.00193468513347143 (x - 162)^3 & x = 162 \\
\end{bmatrix}
\end{align*}
\]

Since these functions are now 1 cm closer to each other, we must now find the new intersection point. To do so, we set the two parts of the new piecewise functions equal to zero and found the point closest to 173 that was returned.

\[\begin{align*}
\text{\textgreater solve} & \text{[-16.616032362501 + 0.0136483477546303 x - 0.063844609404557 (x - 162)^2 + 0.00193468513347143 (x - 162)^3 = 66.65424915895 - 0.45052005653454 x - 0.0748701810472563 (x - 162)^2 + 0.00226789336506837 (x - 162)^3, x]} \\
& 132.0535933, 171.2902328, 215.7042860 \end{align*}\]

To find the area of the empty space inside the hollow statue, we used cross sections by taking the integral of the two functions from 0 to 171.2902328 and multiplied the integral by 22.5. We multiplied by 22.5 as opposed to 23.5 so that the .5 cm thick sides of the statue still remain part of the volume. We set the answer to the variable \(m\).

\[\begin{align*}
\int_{0}^{22.5} k^2 dx & = 74043.71120 \\
\int_{22.5}^{171.2902328} k^2 dx & = 74043.71120 \\
\int_{0}^{171.2902328} k^2 dx & = 148087.42240 \end{align*}\]

To find the volume of the empty space in the cutout at the bottom of the statue, we moved each of the endpoints of the curve closer to the center of the curve to remove the .5 cm solid area of the cutout. We set this curve equal to the variable \(n\).

\[\begin{align*}
\text{\textgreater Curve\textregistered Fitting (Interactive)} & [(1.5, 0), (23.5, 1.5); (46.5, 0)] \\
-0.6595262759922447 + 0.133270321361059 x - 0.00283553875236294 x^2 & n = -0.6595262759922447 + 0.133270321361059 x - 0.00283553875236294 x^2 \\
& = -0.6595262759922447 + 0.133270321361059 x - 0.00283553875236294 x^2 \\
\end{align*}\]

To find the volume of the empty space in the hollowed out cutout, we used cross sections by taking the integral of the curve from .5 to 46.5 and multiplied the integral by 22.5. We multiplied by 22.5 as opposed to 23.5 so that the .5 cm thick sides of the statue still remain part of the volume. We set this equal to the variable \(o\).

\[\begin{align*}
\int_{0.5}^{46.5} n dx & = 1035.00000 \\
\int_{46.5}^{132.0535933} n dx & = 1035.00000 \\
\int_{0.5}^{132.0535933} n dx & = 2070.00000 \end{align*}\]

To keep from removing the hollow part of the cutout twice, we subtracted \(p\) from \(m\) to get the total removed volume.

\[\begin{align*}
m - o & = 73008.71120 \\
p & = 73008.71120 \\
\end{align*}\]
To find the final area of the main body of the statue, we subtract the removed volume $p$ from total volume $j$. We set this answer equal to $q$.

\[ j - p = 12161.00048 \]
\[ q := 12161.00048 \]

To find the area of the spirals, we used the equation for spiral length formula \[
(\pi/2) \times \text{revolutions of spiral} \times (\text{outer diameter} - \text{inner diameter})
\]
for each of the three spirals. We set these lengths to variables $r$, $s$ and $t$ respectively.

\[ \text{evalf}(\pi/2) \times 4/(26.5 + 2.5) \]
\[ r := 182.2123739 \]
\[ \text{evalf}(\pi/2) \times 3/(12.5 + 2.5) \]
\[ s := 70.68583472 \]
\[ \text{evalf}(\pi/2) \times 3/(14 + 2.5) \]
\[ t := 77.75441819 \]

To find the volume of each of the spirals, we used cross sections by taking the integral from 0 to the spiral length of .5 (thickness of spiral) and multiplied the integral by the spiral width of 2.5. We added these volumes together and set them equal to $u$.

\[ 2.5 \int_0^{.5} dx \]
\[ 227.7654674 \]
\[ 2.5 \int_0^{s} dx \]
\[ 88.35729340 \]
\[ 2.5 \int_0^{t} dx \]
\[ 97.19302275 \]
\[ u := 227.7654674 + 88.35729340 + 97.19302275 \]
\[ u := 413.3157836 \]

To find the volume of the legs, we used the disk method for the radius of 1.2 and height of 7. We multiplied the integral by 4 because there are 4 legs. We set this value to the variable $v$.

\[ 4 \pi \int_0^7 (1.2)^2 dx \]
\[ v := 126.6690158 \]
\[ v := 126.6690158 \]

To find the volume of the base, we multiplied the length (27.5) by the width (27.5) by the height (.5). We set this value equal to $w$.

\[ (27.5)^2 \times .5 \]
\[ 378.125 \]
\[ w := 378.125 \]
\[ w := 378.125 \]

To find the total volume of the whole statue, we added $q$ (main body), $u$ (spirals), $v$ (legs) and $w$ (base).

\[ q + u + v + w \]
\[ 13079.11028 \]
1.1 Rules of Sum and Product

Example 1

Suppose you are going to go on a date with someone, and you don’t quite know them yet, so you want to organize the date and give your date options, and let them choose from those options. You only have a short period of time for the date, so you suggest either a movie or drinks. Your options for a movie are a horror film, a romance film, or a food documentary, and your options for drinks are a sports bar for beer or a hotel bar for cocktails.

How many different ways can your date go? In other words, how many options does your date have to choose from?

Solution:

We can generalize this. We just used the following rule.

<table>
<thead>
<tr>
<th>The Rule of Sum:</th>
<th>If a “first task” can be performed in $m$ ways, while a “second task” can be performed in $n$ ways, and the two tasks are not performed simultaneously, then performing either task can be accomplished in any one of $m + n$ ways.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note 1:</td>
<td>We will always assume the $m$ (or $n$) ways to be distinct, unless stated otherwise.</td>
</tr>
<tr>
<td>Note 2:</td>
<td>The rule can certainly be extended beyond 2 tasks.</td>
</tr>
</tbody>
</table>

Example 2

The mathematics department is offering 19 DE sections (211 & 212), 3 Statistics sections (223), and 3 Disco sections (275) this quarter. If a student wants to take only one 200-level mathematics course this quarter, how many sections can the student choose from?

Solution:
Example 3
Suppose your date from Example 1 didn’t go so well, but you have another date set up a week later. Again, you don’t know this person, but you want to organize two activities, a movie and something to eat or drink after the movie. Suppose your options for a movie are an action movie, a romantic movie, a foreign film, or a historical documentary. After the movie, you could go to a diner for some pie, a wine tasting bar, or a pub for beer.

How many options can your date choose from?

Solution:

This example uses the following rule.

**The Rule of Product:** Suppose a “procedure” can be broken down into first and second stages. If the first stage of the procedure has \( m \) possible outcomes, and if, for each one of these outcomes there are \( n \) possible outcomes for the second stage, then there are \( mn \) ways in which the procedure can be carried out in the designated order.

**Note 1:** We will always assume the \( m \) (or \( n \)) ways to be distinct, unless stated otherwise.

**Note 2:** The rule can certainly be extended beyond 2 tasks.

Example 4
Suppose you are creating an online account, and it prompts you to create a password that is exactly six characters, including letters and numbers. Assume that it is not case-sensitive.

(a) How many possible passwords can you make if you are allowed to repeat characters?
   
   **Solution:**

(b) How many possible passwords can you make if you cannot repeat characters?
   
   **Solution:**
(c) What if the first three characters are letters of the alphabet, and the last three are digits?

Solution:

(d) What if you password is the same requirements as in (c) except with no characters repeating?

Solution:

The rule of sum and product can be combined in counting. For instance, consider the following example.

Example 5

Suppose your last date from Example 3 went well and you want to organize a second date. Suppose your date tells you they want to either go to a museum and get dinner, or go on a romantic walk somewhere and get dinner. The choices for a museum are an art museum, museum of natural history, or a historical home. The choices for dinner restaurants are a barbecue place, sushi bar, burger joint, steakhouse, fish and chips shack, or a Cajun restaurant. Your romantic walk choices are a stroll along the river or a long walk on the beach. You found out from your date in Example 3 that your date likes seafood. How many different ways can the date go to your date's liking?

Solution:

Example 6.

Since your focus is on doing well in school, you never put that much effort into buying clothing, but you are concerned that it looks like you are wearing the same thing every day. You have only three shirts and two pairs of pants. You go to class five days a week. Is it possible to not have the same combination of shirt and pants for these days?

Solution:
Suggested Practice Problems

1. How many different 7-place license plates are possible if the first three places are to be occupied by letters and the final four by digits 0, 1, 2, ..., 9? Letters and digits may be repeated.

2. How many different 7-place license plates are possible if the first three places are to be occupied by letters and the final four by digits 0, 1, 2, ..., 9 and repetitions are prohibited?

3. Suppose that the αβγ fraternity has 30 members and they are electing a president, vice-president, and treasurer from within their fraternity. What is the total number of possible president/vice president/treasurer tickets? (Note: No repetitions allowed, e.g., Joe can’t be all 3.)

4. The population of a town is 20,000. If each resident has three initials, is it true that at least two people have the same initials? Why or why not?

5. A multiple choice exam has 15 questions, each having four possible answers, of which only one is correct. How many different test submissions are possible (assuming some test takers have not prepared for the exam and have no clue about which answers are correct)?

These problems were provided by Dr. Diane Evans
# Rose-Hulman Institute of Technology
## Course Evaluation

**Course:** MA371-02  
**Title:** Linear Algebra I  
**Term:** Spring Quarter - 2015-16  
**Instructor:** Felicia Y. Tabing  
**Response Rate:** 18 of 20 ( 90%)

### A. Learning

#### 1. Please rate the quality of your learning in this course.

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Very Good</th>
<th>Satisfactory</th>
<th>Fair</th>
<th>Poor</th>
<th>Count</th>
<th>Mean</th>
<th>StdDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>9</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>4.06</td>
<td>.73</td>
</tr>
</tbody>
</table>

**Explain why your learning was at this level.**

1. **Everything taught in the course, specifically proofs, were written out on the board step by step and very clearly. It really helped get down how to do proofs.**
2. **Material explained well overall. Notesheets and worksheets were helpful. In class more confusing proofs or examples were explained, helping to teach the material.**
3. **I struggled with the material for this class, but I was able to get a lot of help outside of class.**
4. **Dr. Tabing is a bit all over the place sometimes, so it is hard to grasp what she is trying to teach in that instance. Also, she writes so fast that sometimes I cannot keep up, therefore I have to play catch up which isn't ideal when trying to learn. Her note packets are very helpful for learning and studying. The homework load is fair.**
5. **The worksheets were very helpful in reinforcing the class material and what would later be on the exam.**
6. **The worksheets were a great method of practicing the material. I kind of wish that we had a little more practice, especially since I was not very prepared for the second exam, but the amount of work I had in my other classes would not have allowed for it. The methods of teaching used were very satisfactory.**
7. **Dr. Tabing's notes helped out a lot with learning, however. There were times when I looked at a few notes' solutions, and they weren't very clear and handwriting was meh. The pace was fine for this course. I think a hw due every week instead of every day is better for students and most professors do that.**
8. **I think this course had the potential to be very confusing and really hard, but I believe with the format of the class instituted by Dr. Tabing it went a lot better than I expected. I think I understand the material quite well overall.**
9. **The tools I picked up in Linear Algebra are clearly useful. It is clear that I will be able to use them.**
10. **In the beginning, the material was straightforward and a refresher because it was familiar and taught in MA212. Then, we began learning new material. Some of the concepts were beginning to get confusing. I think the course was taught too quickly and didn't really delve into the material until the homework was done. All in all, the course was fair and it gave everyone a chance to boost their grades if needed by having the extra credit or test corrections.**
11. **The worksheets are really helpful. The course materials are well organized.**
12. **I think I have learn part of stuffs in ma212, and the other stuffs are easy.**
15. Can not emphasize enough. Prof Tabing made me realize the effort and work that some prof go to prepare for the class. Excellent in terms of balancing lectures and the number of examples in class. I really appreciate the solutions posted online for every homework, quiz, exam, and notes. Although there are a few typos along the way, it is not much of a problem. So don't take it too hard upon yourself, Prof Tabing. The fact that you show up at 5- late reviewing for several classes exam to make up for being absent in class is very showing of the effort you put in. Keep up the good work.

16. MA371 is a pretty great course. MA371 gives me a lot of new ideas about the use of matrix and vectors. It helps me realize the relationship between a lot of concepts. I've been given a clear lecture and notes about what should I know. I do not need extra time to re-learn course materials in order to finish my homework. So my learning in MA371 is pretty great.

17. I feel like Dr. Tabing was very helpful, but the material didn't feel particularly linear, the first 7 weeks felt overly easy, but it ramped up in theory and proofs dramatically in 8th-10th week, leading to some difficulty for me. I recognize though that a lot of my difficulty probably arose from the habits I had developed early on in the course, when it was very easy, to not pay as much attention as necessary. Coming from DISCO I think I struggled with the proof's somewhat, as they seemed to be almost entirely based on just memorized definitions, which I had trouble with. While I recognize how helpful the notes can be for students, I personally prefer taking my own notes, but I think the way the course was structured it was a bit to regimented on the notes, but that's just personal learning style.

18. A lot of focus on proofs and formal math concepts/language that other classes haven't covered, such as how to do a real proof.

B. Course

2. The laboratory assignments and course material reinforced one another.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<td>12</td>
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<td>.75</td>
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3. The work load for this course in relation to other courses of equal credit was:

<table>
<thead>
<tr>
<th>Much Lighter</th>
<th>Lighter</th>
<th>About the Same</th>
<th>Heavier</th>
<th>Much Heavier</th>
<th>Count</th>
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</thead>
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<td>.38</td>
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</tbody>
</table>

4. Overall, how would you rate this course?

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Very Good</th>
<th>Satisfactory</th>
<th>Fair</th>
<th>Poor</th>
<th>Count</th>
<th>Mean</th>
<th>StdDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
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<td>0</td>
<td>0</td>
<td>18</td>
<td>4.06</td>
<td>.73</td>
</tr>
</tbody>
</table>

Describe one or more strengths of this course.
1. The homework frequency helped a lot when it came to getting a better understanding on where your grade is because there was so much room for getting points. The quizzes helped gauge how well you did each week and where you need to work better.

2. Notesheets and worksheets were helpful. In class more confusing proofs or examples were explained, helping to teach the material. Homework was frequent and short, which helped to solidify newly learned material, as did the weekly quizzes.

3. The time allowed in class to work on worksheets was beneficial since we could ask questions as we went through the problems. Also, the weekly quizzes were good means of preparation for the exams. The homework you gave in a worksheet format was more useful than problems from the book so we could better prepared for the exams and what you expected from us on them.

4. The amount of the worksheets instead of problems from the book. The posting of the solutions was very helpful.

5. One strength of this course was how for every topic covered, there was a corresponding worksheet to go over. It was very helpful working on this worksheet in class with Dr. Tabing there to field questions.

6. The worksheets were a big strength in this course. They were concise and greatly exhibited what was actually taught in lecture. They were also a good model for the exams and provided great study material.

7. The course won’t be too much of a hassle for people. The proofs were a big thing to get used to in the class, and I believe they are the most difficult. Dr. Tabing’s notes and the book help out with proofs though. Time in class for working certainly helped out a lot.

8. Focused fill-in-the-blank worksheets were helpful for guiding notes, and the assignments were spaced well. Having examples and starting homework in class was very helpful for getting immediate help from the professor.

9. The strengths of the course is definitely that the wksts, quizzes, and exams reflected what was taught in class. The students were not being tricked into guessing what answers may be without having seen similar material before taking a quiz. The immediacy of putting up solutions to homework and quizzes was also very helpful. Very few professors do this for some reason, but I believe it is crucial to immediately know when you may be doing or understanding something incorrectly.

10. I liked the materials that were covered. Many of the things I learned seem useful in many areas, including my field of study.

11. The homework and quizzes given were fair and reasonable. The amount of work was tolerable - wasn’t too little or too much at all. All the course material were extremely helpful especially since everything was posted to Moodle in a timely matter. I also liked working on the worksheets in class then finishing it at home.

12. Dr. Tabing is helpful and she is well prepared for class.

13. This course have a good focus on linear algebra. Many stuff we learned was closely relative to each other.

14. Although workload is lighter, it is more effective.

15. Gives a picture of relationships between different concepts in linear algebra.


17. Its schedule does not make me stressed out.

18. Its exams were well designed.

19. The worksheets Dr. Tabing provided were good practice for the exams, and she was very happy to help with any issues.

20. Taught math theory and definitions that are universally applicable within math, as opposed to other classes that encourage the memorization and repeated execution of techniques.
Describe one or more ways this course can be improved.

1. N/A

2. Perhaps have a couple longer homework assignments (with an appropriate gap in homework to compensate, keeping workload constant)

4. I would have preferred to have less time to work on stuff in class and more example problems. I often had to go to video online to try to understand topics more and I found that understanding the visual aspect of what we are doing helped me understand, so maybe continuously be going back to the 3d models to show what we are actually talking about, when possible.

6. This course can be improved by establishing the definitions of certain things better. One example I can think of is the Row and Column space of a matrix. I both kind of understand and don’t understand exactly how to find it. There was not really a worksheet explaining the exact method of how to do that.

7. One way the course could be improved would be to have the students be more involved in the note-taking process. Keep the handouts, but have more blanks to fill in. For example, have some of the definitions blank so that the students will have to fill those in as they go. I know I learn better when I actually have to write things down instead of just listen. However, don’t take this too far - too much writing will get the students distracted from the actual material. Just find the happy medium.

8. I think the course could be improved if homework assignments were due every week instead of every day. This makes it easier for students to work ahead, dedicate some time to harder subjects.

9. The pace seemed quick, if only because there wasn’t much of a smooth transition between topics, making the course seem very segmented. Also, there wasn’t much need to transcribe the notes on the board during every class. Clarifying statements, proofs and examples were helpful, but we can read the typed notes on our own. Other than that, I don’t like proofs in general, but they just seem to be part of the course itself.

10. Sometimes the pace of the class became overwhelming. I believe the pace was the same throughout the class so that it did not become slower or faster at any point, but towards the end the pace, which was generally faster than other classes, of the harder material started making understanding become difficult. The material in the beginning was easy to understand at the faster pace because it was mostly review or relatively easy concepts and definitions, but at some point around 7th week it seemed like all of the theorems and definitions became interconnected and it was more difficult to see how they connected without more forethought. Therefore, I would suggest slowing the class down later on in the quarter and trying to allow for more time in class to work on the wksts that were handed out. The worksheets later on in the quarter also took a lot longer than the ones earlier in the quarter, so possibly also handing out a lesser frequency of worksheets with more time to work on them in class would definitely help our understanding.
11. I would like to have more time on linear transformations and change of basis. There was only about a week devoted to these topics, and I feel that they were rushed. I think they are the most useful tools that I learned this year, and yet I had the least amount of time to practice them.

The amount of work was fine. It is a very theory-based class, so more work would not prove useful.

The pace and level of material were appropriate.

I very much enjoyed the notes handed out. These were especially useful since they have the formal definitions written on them, as well as the examples we worked on in class.

I also liked working on the worksheets in class. This was a good idea. Since it is a very theoretical class, online help isn’t that useful. This means that if I took it home and had a problem with it, I was going to have to wait until next class or come into the office. By working on it in a class a little, I was able to find my problems and ask Dr. Tabing immediately.

12. I think the pace should be slowed down a bit. The notes were helpful when studying, but in class, I would not pay attention as much since whatever is written down on the notes were copied onto the board. I think it would be helpful to let the students first figure out how to do the exercises in the notes first rather than write the question then answer immediately. Or have some blank spaces in the notes for us to fill out the main idea. Also, more examples in the worksheets would be helpful.

13. Maybe go through more deep topics of Linear Algebra.

14. This course cover lots of knowledge in MA212, maybe we should add more thing into this course rather than review the materials in MA212. Or we can learn deeply in the same field.

15. More examples will always be better (for me personally). Otherwise, great!

16. Some courses materials are same as DE2(MA212).

17. I think the pace should be leveled out, if possible, and if there’s any ways the proofs less memorization based, I think that would be a good direction to go down

18. It would be nice if the introduction to doing proofs was longer, as before this I had extremely little experience with doing them.

C. Instruction

5. The professor was well prepared for class.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<tr>
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<td>0</td>
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<td>18</td>
<td>4.56</td>
<td>.51</td>
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</tbody>
</table>

6. The professor used teaching methods which helped me learn.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
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<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
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</table>
7. The professor was available for help outside the classroom.

<table>
<thead>
<tr>
<th></th>
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<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
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<td>.5</td>
</tr>
</tbody>
</table>

8. The professor seemed genuinely interested in teaching this subject.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
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</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
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<td>0</td>
<td>18</td>
<td>4.56</td>
<td>.62</td>
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</table>

9. Please rate the professor's overall performance in this class.

<table>
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<tr>
<th></th>
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<th>Very Good</th>
<th>Satisfactory</th>
<th>Fair</th>
<th>Poor</th>
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<tr>
<td><strong>Total</strong></td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>4.61</td>
<td>.5</td>
</tr>
</tbody>
</table>

Explain why you gave Felicia Tabing this rating.

1. I enjoyed having Dr. Tabing as my professor because she was very easy to approach when it came to asking questions. Many professors have a discouraging vibe, but she did not whatsoever. This is important when it comes to understanding content because it opens up another resource.

2. See other sections...

3. I really appreciated how quickly e-mail questions were responded to and the in-depth response as well. The interest she had for the subject was reflected in the lectures and made the class more enjoyable.

4. Dr. Tabing was extremely great in how prepared she was and the effort that she put forward. My only negative comment is that I needed to go to other sources to actually understand what was going on.

5. Dr. Tabing is a bit all over the place sometimes, so it is hard to grasp what she is trying to teach in that instance. Also, she writes so fast that sometimes I cannot keep up, therefore I have to play catch up which isn't ideal when trying to learn.

6. She definitely enjoys what she does and that is essential for the students to be able to learn. Maybe one thing she could improve on is making sure that everyone "gets it" fully before moving on. I realize this is very difficult to do in a proof-oriented class.

7. Dr. Tabing did a great job in presenting the material for this course. She was always very well prepared for class and had the notes and worksheets waiting for us when we arrived. I was also a big fan of having time in class to work on the worksheets, as well as allowing collaboration on a few of the quizzes. I strongly believe that people learn better when they teach others, and this provided a great opportunity.

8. Dr. Tabing is a good professor, and I like her worksheets, notes, and frequency of quizzes. The only thing I'd want to change is the frequency of homework worksheets. Also, she does make mistakes on the board that end up confusing me. Also, the typos on sheets. Other than that, she is fine as she is.

9. Very helpful outside of class; could work on having a few different ways to explain concepts and general consistency. Typos also put us behind a bit.
10. Dr. Tabing is a great professor because she obviously understands the material very well, wishes for the students to understand the material too and does a good job of explaining the material, does not trick the students, and is an overall reasonable person. I really enjoyed the format of the class! It was great. Having in class notes already printed out and organized, working on worksheets in class, quizzes and exams announced ahead of time, all of our grades on Moodle, and immediately posting solutions for homework, quizzes, and even the in-class notes! I could literally not ask for a better organized professor or a more fair class. There are not tricks happening in this class and you do not question what grade you have in the class. While in Dr. Tabing's class it really feels like learning of the material is the primary focus. I do not feel this in class often as a lot of professors seem to focus on whatever grade you may have in the class and only tailor your learning to where only the smartest kids may understand it. Dr. Tabing truly wants and believes every student in the class can understand the material and this is shown when she encourages us to work together on worksheets in class and will walk around and answer every question to the best degree. If there are any improvements I would suggest for her to slow down her pace from time to time. I'm sure she has the capability of writing things on the board near the speed of light, but some of us are slower writers. Overall, a great course and a great professor.

11. Dr. Tabing does a great job. My only recommendation for her is this:

Sometimes, it is difficult for me to keep track of what exactly things mean. For instance, when we were talking about the kernel of a transformation it was much easier for me to grasp the math after having been told what it was in words rather than in math terms. "All the inputs that have a trivial output" was much more useful for me personally.

Keep it up!

12. Dr. Tabing was really fair with this course. She wanted everyone to have an equal chance and wanted everyone to have a good grade. She was always available and helpful during her office hours or if a question was asked. She is also very punctual when posting materials on Moodle. However, during lecture she does go a little bit too fast and it would be beneficial if she had student interaction when teaching on the board.

13. She is easy-going and patient.

14. I like to study with work sheet and handout. I prefer more in-class working time.
In the solution in the handout, sometimes the writing of Dr. Tabing is not clear and hard to read.

15. Prof Tabing's instruction for this course will definitely improve; she expressed her dissatisfaction with her current performance and has an organized plan on methods to improve her instructions on this course in the future. Although she may not be "genuinely interested in teaching this subject", I do not think one can pretend to be genuinely interested and teach in that subject well if one is not interested in that subject. Anyways Prof Tabing is friendly, outgoing, approachable, admirable, and most of all, cool.

16. Dr. Tabing is a great professor. She helps me understand many proving skills. She is always fully preparing for the lectures. Her notes and questions are also easy to understand. She also spends class time efficiently. I am actually expected Dr. Tabing gives more proving examples and practices in class.

17. She was always active and happy to help, and provided more than enough material to learn what was required, and she was prompt and helpful when students had issues

18. Great at teaching things to small groups or when answering questions. Professor Tabing gives out note sheets that cover what is gone over in class, however most of the things she writes on the board other than example, such as definitions, are already in the note sheet, so a lot of time could be saved by not writing things twice. Also, Professor Tabing makes A LOT of typos and errors in homework handouts and on notes on the board that sometimes distract from learning. She is often really prepared for class with handouts and example, but it's hard to overlook the number of things that needed to be corrected on the homework before some problems were even possible to start.
Course Evaluation

Course: MA375-02
Title: Discrete & Comb Algebra II
Term: Spring Quarter - 2015-16
Instructor: Felicia Y. Tabing
Response Rate: 14 of 17 (82%)

A. Learning

1. Please rate the quality of your learning in this course.

<table>
<thead>
<tr>
<th>Quality</th>
<th>Count</th>
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<tbody>
<tr>
<td>Excellent</td>
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<tr>
<td>Very Good</td>
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Explain why your learning was at this level.

2. Many of the lectures for this class took all period, which didn't give me much time to engage with the material prior to leaving class. I sometimes find it difficult to remember concepts if I don't do any practice problems in class. That being said, I remember the majority of the concepts in the class after having turned in the homework and assignments.

3. The material was interesting and I had one of the best math professors ever!

4. I learned all I expected to.

5. The quality of learning in this course was very good due to my interest in the topics and Dr. Tabing's daily worksheets.

6. This was my second time in the course (grade replacement) and I feel that my grasp on the concepts only slightly improved. Most of this course required me to reteach myself the material which I was not strong in to begin with.

7. It was good, no real complaints

8. Difficult class and if you fall behind in it is hard to catch back up. I often had little understanding of the assignments and quizzes but learned more after seeing the solutions to the quizzes, but no solutions for the assignments were given. The material is covered very quickly, granted there is quite a bit.

9. I feel I learned about a lot of intricate mathematical processes/systems. The homework was concise, long enough to cover everything but short enough to not feel like busywork.

The handouts were particularly helpful; they were a good summary of book readings and were good for reference for studying and completing homework. Having examples to fill out/complete during class helped tremendously.

10. I am still a little misty about parts of exam 3 and need to re memorize exam 1 and 2. however, I understand the material and will be ready for the final.

11. I feel like I learned all of the material very well. It was taught in a nice sequential order so that it could build upon itself.

12. I understand the knowledge and theory very well and can apply them to solve the problems.
13. I did well in first 2 exams! I think I can get A
14. Dr. Tabing teaches well. And she is really nice in person

B. Course

2. The laboratory assignments and course material reinforced one another.

<table>
<thead>
<tr>
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3. The work load for this course in relation to other courses of equal credit was:

<table>
<thead>
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<th>Lighter</th>
<th>About the Same</th>
<th>Heavier</th>
<th>Much Heavier</th>
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4. Overall, how would you rate this course?

<table>
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Describe one or more strengths of this course.

1. The workload was what it should be, one assignment per topic covered and 1 quiz at the end of each week. The assignments were long enough to check and reinforce topics without being so long that it became tedious repetition. Even though I took this class as an elective (so it isn’t relevant to my major), I found the topics interesting and I can understand much more of what my friends who are in the computer/math field are talking about even though it was only one class’s worth of information.

2. The content of the course was not as difficult as I had anticipated. I appreciated the consistent schedule: (quiz every week), exam every 3 weeks. The in class notes and solutions on moodle were extremely helpful. I also enjoyed the activity on Rook polynomials, because I got to engage with the material myself by completing a packet, which was a good change of pace.

3. The material was legitimately interesting.

4. Good pace, level of material was right for a 300 course.

5. I liked the daily homework since it allowed me to figure out what I did and didn’t know right away as opposed to other classes with weekly homework. I enjoyed the content of the course and thought the pace was average. I am split on the notes however, they are for reviewing and studying, but they make it easy to not pay attention during lectures. I also liked collaborating with other students for homework at the very end of class, it helped me understand the material more by talking about it.

6. I liked the printed notes. It saved time during class and allowed me to focus on getting examples down rather than definitions.

7. The material made sense and complimented what we learned in disco 1.
8. Having access to all the notes on moodle.
9. The work was somewhat on the light side, but it covered everything necessary and every type of problem we discussed in class. The pacing of the class felt good, a new topic every class is manageable because the homework was light yet thorough enough to not feel overwhelmed. Handouts were particularly helpful as reference sheets for studying/homework. Moodle solutions were also a great benefit.

Time in class to work on homework was nice as well.

Review topic lists before tests were helpful in studying and general preparation.
10. interesting applications and very good at explaining motivators.
11. It did a good job of keeping things moving. The time for homework in class was great because it gave me an easy time to ask questions in person. When the difficulty of the course increased it also became more interesting, so I had motivation to learn and truly understand the difficult parts.
12. Handout is very useful and definition is really helpful for us to understand the material.
13. We have hand out which can help us learn it very well!

Describe one or more ways this course can be improved.

2. I would like to work in pairs or small groups more. For the first half of the class, I didn't know the student sitting next to me. I would also like more time every day to work on worksheets.
3. none
4. More class involvement during lectures
5. The biggest improvement that could be made is to the lectures. I didn't like how some of the proofs were hand-wavy.
6. More class examples would be great. Especially examples that mirror the homeworks. Simpler examples to get the basic concepts down before applying them to more complicated examples. Going through an entire example rather than just doing parts of it and leaving it unfinished. Finishing in class proofs
7. It was good, I can't think of anything
8. The professor going over some of the worksheets more.
9. The first two tests felt a little basic in terms of complexity of problems and material comprehension necessary for completion.
10. I did not take good notes and because of this there was no way to check if my notes were right or optimal. if there was a book or website to reference for general concepts that may have helped.
11. I would have liked a bit more on generating functions and going back to earlier problems and solving them with generating functions.
12. Maybe add some more interesting things like bubble sort.
13. Nothing!

C. Instruction
5. The professor was well prepared for class.

<table>
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6. The professor used teaching methods which helped me learn.

<table>
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<th>Disagree</th>
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7. The professor was available for help outside the classroom.

<table>
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8. The professor seemed genuinely interested in teaching this subject.

<table>
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<tr>
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9. Please rate the professor's overall performance in this class.

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<th>Count</th>
<th>Mean</th>
<th>StdDev</th>
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<tr>
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<td>1</td>
<td>0</td>
<td>14</td>
<td>4.07</td>
<td>1</td>
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</table>

Explain why you gave Felicia Tabing this rating.

1. I liked that Dr. Tabing printed the notes out for us each day so we could focus on the actual examples and understanding them rather than furiously scribbling everything down and falling behind and missing what she is talking about as she does it, the notes also made it useful when studying because it was in an organized manner and labeled (compared to my shifting through my notebook and trying to remember what corresponded to what), availability of notes were also useful if class was missed having time at the end of class to work on the worksheets was useful so I could start while it was still fresh in my head, also gave an opportunity to ask questions since I often can't make it to office hours I prefer the worksheets as homework over the book assignments because the book gets tedious and honestly if you get frustrated enough with the book the solutions are out there somewhere, whereas the worksheets aren't as tedious in the first place and force you to stop and think about it to figure it out
2. Dr. Tabing grades fairly and flexibly, which I appreciate. I would like it if she were to explain the details of writing proofs. I feel like I still don’t have a completely solid framework for writing proofs. I appreciated having nearly immediate feedback on my worksheets, quizzes, and exams. One place for her to improve may be catering to students who have different learning styles. Students who have difficulty following along with lecture for extended periods of time may become disengaged from the material.

3. Easily the best math professor I’ve had at Rose-Hulman thus far. I hope more proffs can emulate her teaching style!

4. She taught the class well, but I could tell she wasn’t super interested in the topics.

5. Sometimes Dr. Tabing has a difficult time explaining things to the class. This is not due to a lack of knowledge in the course material and will probably improve over the years. Dr. Tabing’s worksheets and notes helped me learn and understand the material. Tests could have been more challenging, and the course a little more rigorous, but I was pleased with Dr. Tabing’s performance overall.

6. Dr. Tabing was unprepared many days to teach and would often make large mistakes in her work when teaching the class the resulted in having to redo long problems. She was also unreliable in office hours and would teach things irrelevant to the course and gloss over important topics for us to “figure out on our own”. If given a choice I would opt to not take a class with her again.

7. Good Job

8. Great Professor, she is sometimes sporadic and hard to follow but she always slows down and catches people up. Handles the amount of material very well and if every single person in the room had a question she would go to them individually to answer it.

9. She was enthusiastic about teaching the course and very knowledgeable as well. Initially, the teaching style of basically rereading/rewriting the handouts felt bland at first when the content wasn’t super intricate (e.g. Language section), but after a while it became more helpful when the material became more complex, and explanation beyond the handouts were necessary to learn adequately (e.g. recurrence relations).

   other things:
   Working examples in class is very beneficial.
   Having so much of a safety net on the first test (10 free points plus EC) felt like too much.

10. I suggest that after you teach a concept that you do a review to make sure people understand the concept. In exam 3 especially I feel like a lot of people didn’t understand the concepts and were too afraid to speak up/thought they could figure it out on their own. If you asked a question and everyone saw they weren’t alone they would be more open to asking questions. exam 3 seems to be the hardest part to, so i suggest more time or homework should be dedicated to this portion.
11. There were many late nights when I was working on homework and came to an issue and I thought to myself "man, if I e-mail Dr. Tabing I probably won't get a response until tomorrow morning." I would then e-mail her, expecting to need to rush through it in the morning, go get ready for bed, and get an e-mail clearly explaining my issue, why it was an issue, and a hint on how to fix it. Dr. Tabing is without a doubt the professor that I have asked the most questions outside of class, and they were all answered exceedingly well.

Dr. Tabing always gives out copies of notes that usually have definitions and important equations already on them. I realized quickly that I would need to supplement these by taking my own notes as well. This system worked very well for me. When I would go back and study, the papers did not have the examples filled in and covered the very important parts so I could look at them and solve them without seeing the answers below. I would suggest everybody use this system as it also forced me to be more engaged in class.

The weekly quizzes that we got saved me multiple times. I would slack off for a bit, do poorly on the quiz, and realize that I needed to study certain topics more. I highly appreciate the weekly checks.

When I realized that I had a new professor teaching a higher level math course I was honestly afraid of what was to come, but Dr. Tabing easily made sense of the class and taught extremely well.

12. She is very nice and willing to help students. She gives us some interesting problems to help us to understand the knowledge.

13. She can explain every problem and give us hand out!
A. Learning

1. Please rate the quality of your learning in this course.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Count</th>
<th>Mean</th>
<th>StdDev</th>
</tr>
</thead>
<tbody>
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<tr>
<td>Very Good</td>
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<tr>
<td>Poor</td>
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</tbody>
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2. Count: 15

Mean: 3.67

StdDev: 1.11

Explain why your learning was at this level.

1. I did pretty well on the tests so I guess I got the stuff.
2. Seemed like information was repeated a lot (not necessarily a good thing or a bad thing)-- information in verbal parts of lecture was often word-for-word the same as the notes, and whiteboard was similar. I assume this was to accommodate mixture of visual and auditory learners, but I found getting the same information 3 times more distracting than anything.
3. Certain things in this course were glazed over with little to no explanation, for instance everything we've done with recurrence relations, initially the first lesson was sort of pushed aside as this is really easy, but the next two were on a whole different level of difficulty. I'm really not sure what the point of those even were, as there was no context given aside from it's on the test. The notes were helpful, I guess. Some of them were already filled out when given to us, which I fail to see the point of. It just encouraged me to not pay attention as I had nothing to write or do. Overall I really am not sure what I was supposed to get out of this class, and I definitely do not feel confident on any of the material.
4. I mostly used the book to teach myself the material - I spent many more hours studying for these tests than my other classes because I had a tough time understanding the material in class, and I could never find the professor because I had class when she had office hours.
5. Reinforced some of the topics that I knew from taking this course the first time, as well as helping to teach me some of the topics that I didn't quite understand the first time.
6. I think that this class was taught well, I did not like the use of notes sheets, I thought that they were intended to make it easier to take notes, but looking back, I find that it's much harder to study from them than from just notes alone. I also had trouble keeping track of what was due and when.
7. I learned all the material that we needed to and I felt like that I knew how to apply the content when it came to exams and tests. I thought that the end of the class was rushed which some of the topics that we learned are a bit fuzzy but overall I felt like I learned everything in this class that I needed to.
8. The class is simple and direct. Usually started with definitions and examples, and then it's work time. I really like this kind of style of teaching.
9. The notes are helpful. but I just hope there could be more examples be discussed in the class because I don't really understand those concept sometimes and examples really help.
11. I am not quite confident about my study in generating function. I do not fully understand it now. I feel good about other part.

12. Definitely a great course. It was taught in a different style than Disco I, but had just as much constructive and interesting information. The worksheets can seem a little overwhelming in quantity, but I found that they were actually a really effective learning aid. It was much better to have problems written by our professor that are more likely to show up again, or at least to have problems that make us familiar with the format. Personally, I thought the notes sheets were extremely useful, as they really highlighted the important information, which made following the lecture and examples on the board easier and more engaging.

13. I liked the guided notes that were given out in this class, it made reviewing easier and help when following Dr. Tabing's lecture. Dr. Tabing was also great at explaining the point she was trying to get across to the students.

14. I wasn't pressed to work as hard in this class because there was no concrete due date for most of the homework. This lead to me doing poorly on a couple exams and quizzes because I wasn't familiar enough with the material because I hadn't done the homework yet. Otherwise, I think I did okay. I eventually understood most of the topics and how they worked, but there is still room for improvement, mainly with the professor.

15. I learned a lot and did well on tests

B. Course

2. The laboratory assignments and course material reinforced one another.

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<th>Strongly Agree</th>
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3. The work load for this course in relation to other courses of equal credit was:

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<th>About the Same</th>
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4. Overall, how would you rate this course?

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<th>Fair</th>
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<td>3.93</td>
<td>.96</td>
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</table>

Describe one or more strengths of this course.

1. Dr. Tabing is helpful, funny, and available, and she's got so much better this quarter I am so proud of her.
2. Workload was fine (hard to choose between "lighter" and "about the same" above, chose "lighter" more because of due date flexibility than actual workload)
   Solutions on Moodle were useful in studying for exams and filling in gaps in understanding from missed class
   Worksheets >> book homework (more directly applicable to course content, more similar to exams, more relatable examples, etc.)
   Already mentioned, but due date flexibility was really nice-- I found the worksheets to be more useful as exam prep than as "regular homework" and was not really penalized for using them as such
3. Being able to start the worksheets in class was nice. If we didn't have that time for a few of them it would have been incredibly overwhelming sometimes with the amount of worksheets.
4. The course is decent, it teaches aspects of math that can be used in statistics, computer science, and theory. The class itself is useful.
5. Homework load wasn't too excessive, helped to make learning the course material easier, as well as reinforcing the ideas from the class lectures.
6. This course covers complicated topics and explains them well.
7. The amount of work is good, and homework is not too little and too much.
   it's helpful to get the solution of the handout after class.
8. I liked the notes. It was easy to follow the lecture with the note sheets and they were a good reference when doing other problems. I think the worksheets were good because they were more along the lines what we learned in class than the textbook problems would be. The tests and quizzes I felt were fair to what we learned in class and that there were no questions that were too hard to answer.
9. The amount of homework is reasonable. Although there is homework almost everyday, it's not that much.
10. I guess it would be the light workload? We have worksheet as homework and we have time in class to do it. Sometimes we can finish it before the class end.
11. The material in model is helpful.
   I love the extra credits we earn from quizzes and exams.
12. Effectively built onto Disco 1 concepts while implementing new material
   Strong class structure in terms of lecture time and work time - it was great to have time to work problems on our own while still being able to collaborate and ask questions.
13. The material progressed in a logical way that made connecting the dots easier.
14. It mostly made sense (at least to me). I picked up on the first couple of topics because they made sense. I've worked with strings before, so language wasn't difficult. I know how to program, so building finite state machines and understanding the process in simplifying them wasn't difficult. I've fiddled with some cryptography, so that also wasn't difficult. etc..

I liked the predictability of the course. Every day was scheduled and every Friday there was a quiz/exam. This was wonderful and I like to see it. Although it takes the fun out of spontaneous teaching, I think that being predictable outweighs that.

The pace was okay. I felt it was a little rushed, we didn't review as much as we should have, but the pace was never too way fast.

I liked having the notes in class. I like them because it made the learning more direct, and it meant that we were less reliant on the book. In fact, I actually didn't even use the book this entire course to study and I don't think its necessary (which is AWESOME!!).

I felt that we used class time effectively for this course. I never felt like we were wasting time, and every minute felt important.

15. Good topics and teaching methods

Describe one or more ways this course can be improved.

1. Give me less homework please, a worksheet a day sometimes is too much work.
2. Felt like there was too much class time dedicated to worksheets, could have been used to work more examples. This might sound dumb/very tailored to my learning style, but I think having "pairs" of similar worksheets would be helpful, so one could be used to study for Friday's quizzes and one could be used for exams.
3. The workload really didn't make too much sense. Some weeks there was a new worksheet every day, and some weeks there would be a single worksheet. I guess it was okay seeing as there weren't any real deadlines on them, but it was really overwhelming to have 4 worksheets before a test, and since the worksheets were supposed to be practice, there was always at least one topic I had to rush through and didn't feel confident about at all for the test.
4. Ensure that the necessary background for what is being taught either is taught in a prerequisite or reviewed in the class - many people struggled with poorly explained concepts that needed a background in computer science to understand fully.
5. Possibly cut the allowance of pseudo-unlimited late days, as they allow for students to just not do the work and not know what is going to be on the exam (perhaps just make the assignments due before the exam at the latest).
6. I think that this course jumps around in what it covers quite a lot, and that makes it harder to study for tests as the material does not necessarily relate back to itself.
7. I think that the homework load in the beginning was good but as the course went on we just got more and more homework which was overwhelming. Also, we got less class time to work on the worksheets as well which made the work load more unmanageable. I think that you should try to be more consistent with the homework and if you have to give more homework in the beginning so people know what is coming near the end that would be better than just increasing the workload at the end.
8. Not really
9. Having time to do worksheet in class is great, but I just hope there could be more examples being discussed in class.
11. Maybe add one or two class about generating function? Especially the part of Summation Operator. Some problems in the worksheet is kind of ugly, the numbers are hard to calculate.

13. I don’t think that this course needs any improving from where it is now.

14. More review and relation of ideas. Some of the stuff presented didn’t stick the first time (derangement) and needed to be reviewed in order to be understood. To relate ideas, maybe publish an overview for the topics learned for the week before the quiz?

As stated before, I think having a more concrete deadline on the homework would be beneficial. I appreciate that we don’t have to have them done by the due date, but overall it lead to more slacking off and made a significant impact in my learning. Maybe have some sort of punishment that kicks in after a set grace period (like maybe a week) to encourage getting the homework done while it relevant?

15. Good course, mabye more test review?

C. Instruction

5. The professor was well prepared for class.

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6. The professor used teaching methods which helped me learn.

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7. The professor was available for help outside the classroom.

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8. The professor seemed genuinely interested in teaching this subject.

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9. Please rate the professor's overall performance in this class.

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**Explain why you gave Felicia Tabing this rating.**

1. *She is this intelligent funny easy-going human being. I really liked her classes and herself.*

2. *Think I only went for help once or twice outside of class, but was generally available if needed and was helpful when I did go*  
   Sleep-deprived Dr. Tabing is fun, she should try to get stuck at the airport more often (I mean that in the nicest possible way)

3. *Her teaching styles just don’t really mesh with me, I guess. On all of the quizzes there were problems or definitions that I guess I was supposed to pick up from being in class and following along on notes, but none of them ever really stuck. The material for the third test, coupled with not having two class periods really threw me for a loop and left me pretty confused about everything. The last third of the class I really have no idea what i’m doing in, and although yeah, some of it probably can be attributed to myself, I definitely think that some of it came from the way the material was presented and taught. One of the biggest things I can always expect to get out of courses here is that there's always a sort of "key takeaway" from them that gets brought up later down the line in courses, but for this one, I’m struggling to see what it could even be.*

4. *Dr. Tabing is a pleasant person who enjoys mathematics. However, I had a hard time learning from her because the way she teaches doesn't work well with the way I learn. She mainly just worked examples on the board, background for any of what she was teaching was very poorly explained. I did enjoy daily homework, it helped to make sure I was learning the material before I got too far behind, but I was basically teaching myself.*

5. *Very good at explaining what was going on, as well as explaining what was wrong about student solutions, or acknowledging that their solutions are also correct. Helped to make sure that all of the students were learning what they should have been,*

6. *The professor for this course was well prepared for classes and knew the subject matter well. I found it hard to get help outside of class sometimes though.*

7. *She is a very good professor and i like her method of teaching*

8. *All teaching habits were good. I learned from every lecture and I like that there were many examples because it made it easier to understand the concepts and how they were used. The only problem I had was sometimes that lectures were not well planned time wise and we would have to rush through a couple of concepts or examples which made it easy to get lost during those parts. I wish that instead of giving us time to work on worksheets in class, she would plan how long lectures would take and maybe start on a long lecture the day before so we have more time to go through it the next day in class. Otherwise, I felt that she was very helpful with solidifying my understanding of all of the topics covered and she went through the material enough for me to grasp concepts in lecture.*

9. *Professor Tabing is very nice. She is always willing to help students in class or outside class.*

10. *Dr. Tabing focus on concept a lot and it is a good thing. But I’m just bad at learning concepts. I like to have examples to reinforce what I’ve learned. Her teaching style is kind of off from my preference but she is still a good prof. Her handwriting is better compare to some other profs I had. The structure of the class made the workload lighter than other classes, and quizzes every week helps learning.*

11. *Dr. Tabing is great. Her class was relax and easy. I love her style in worksheets and handouts. Dr. Tabing put all the material into model and I can get them easily when I need.*
12. You can really tell from a single day how engaged Tabing is in Disco content. She tries to go above and beyond the required course material to teach us interesting things like topology, and knot theory.

I find it incredible how much time she puts in for her students, as it is obviously no easy task to create notes sheets every day on top of grading and other work, yet she always does an excellent job in making sure that we're prepared.

My only concern is that Tabing can be a little too lenient when it comes to work. I'm not saying it's a bad thing, but not requiring the homework to be turned in exactly on the day it is due causes some people to slack off.

Overall, I thought Tabing was a great professor, and would seek out her courses in the future.

13. Dr. Tabing was always asking if the class had questions, making sure we all knew what she was writing and why. She was also great at explaining the concepts that we covered.

14. Dr. Tabing is a very capable professor, but I think that's part of the problem. It seems like Dr. Tabing has difficulty in bringing subject material down to a level and rate at which we can understand and absorb it well. Granted it wasn't as bad as Disco I when I didn't have ANY prior disco knowledge, but I can still see that it's there. It seemed like she wasn't all too good at predicting which topics would be difficult for us.

She also writes/talks fast, and that can make following her though pattern for a problem unnecessarily difficult.

Despite those negatives, Dr. Tabing was actually pretty good as a professor. Definitely not the train wreck she was for Disco I. It seems like she cares and wants us to succeed, and I appreciate that. I think that given more time and experience to understand the how to best get her students to learn, she could become a great professor.

15. Good teacher, mabye a little disorganized some days but it didn't effect my learning
A. Learning

1. Please rate the quality of your learning in this course.

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Explain why your learning was at this level.

1. The material was almost completely new material and that paired with a new professor made the course more difficult than it probably should have been. However, the teacher did try very hard to make sure everyone understood and was very approachable. The extra credit opportunities were very helpful.
2. We went over all the material but I have trouble understanding and remembering some of the main concepts when asked at the end of the course.
3. There were times when either the information was not being explained or it seemed that you didn't know what you were doing. That may be because this is an 8 am class and you are a younger teacher. Just be confident in yourself, because it sometimes looked like you weren't confident enough about your own abilities to teach us.
4. Much of the learning I did was done staring at homework problems. Dr. Tabing had some good lecture days but also some bad lecture days.
5. I understand the topics covered in the class better than when I came in but there are some topics that could have been covered better.
6. I understood a lot of the information with this class. Fully retaining it for tests wasn't the easiest, but understanding was very well done.
7. I feel like I didn't learn as much as I should have learned in this course. All the information was presented, but I feel as though it wasn't presented in a way I was supposed to learn from.
8. The material at the beginning of the course was more difficult for me to understand given the professor's teaching methods; however, I feel that she presented the information better at the end of the term.
9. Dr. Tabing did a pretty good job of making sure we understood each topic learned.
10. Professor Tabing just did not teach me well. Her explanations were not clear most of the time and then there were times that she didn't even know how to solve problems she was trying to explain to us.
11. Teaching style didn't match up with learning style.
12. My grade in the class isn't the best but I did learn a lot from the class and how to better myself when it comes to studying and getting help.
13. I basically understand what is in MA112.
B. Course

2. The laboratory assignments and course material reinforced one another.

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3. The work load for this course in relation to other courses of equal credit was:

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4. Overall, how would you rate this course?

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Describe one or more strengths of this course.

1. lots of opportunity for extra credit and large amount of practice.
2. The notes are given so you can really focus on how the problems work instead of trying to keep up with writing.
3. Having the examples in the notes is useful, since we have to fill them out ourselves.
4. Dr. Tabing recognizes when her students are struggling and is very forgiving on late work if she believes that working on it another day would be beneficial to a particular student.
5. The organization of the course was done very well.
6. she assigns good challenging homework that helped me learn
7. Hammering down with work to have you understand.  Good presentations
8. The projects were helpful in reinforcing the material learned.
9. This is a math class. You come and learn. I don't have ant specific strengths I can think of.
10. The course allowed us to use integrating techniques in an applied situation to show how the material would be useful.
11. We were given printed out note packets each day
14. The workload was balanced fairly well. There were some weeks where we had 2-3 assignments due back to back and it seemed a bit much but it was mostly well balanced.
15. The number of projects.
16. Calculus 2 is one of the toughest classes I've ever taken, but you learn so much that you can relate to other classes.
17. I gained more knowledge during this course
18. Clear directions and explanations which led me to high grades
Describe one or more ways this course can be improved.

1. The load of assignments and homework was bordering on too much. Also, more useful examples on the board that are like the ones we are asked to solve would have helped. We would be shown how to do an easy version of the type of problem, then be asked immediately to solve a problem on our own that had a trick to it. We were still trying to get the concept. If another more difficult example along with simple example was shown, it would have helped.

2. This course could be improved if the material was better explained and we went over more problems in class. If we could have more time to do problems in class, I might have been able to better understand the problems I did in the homework.

3. I think that, while having the notes typed out for us is nice, I think it might be more effective to have it so that we have to write more of the notes, just as a way to both be more involved in class (to help keep people from falling asleep) and to help us learn the material better.

4. Dr. Tabing’s teaching style is rushed, like the walls are closing in on her and she has to get everything out of her mouth before the bell rings. If you’re reading this Dr. Tabing, try to relax a bit. When you seem like you’re rushed, I feel rushed, which makes my learning rushed.

5. We had a lot of homework problems each week. Not many examples were done or completed in class so it made it hard to do the homework. It would take me hours at times and much more time than any other class. I enjoyed the projects that we did but they could’ve been spaced out better. At one point we had three projects assigned to us in one week. Then the project due dates kept getting pushed back because of homework assignments. That make it difficult to have time to do both.

6. The teaching style could be less rushed at time and better taught out. She took the material straight out of the text book and no shortcuts were taught when they would have been more memorable and easier to do.

7. Work outside of just out of the book. Tutorial problems

8. There should be more time in class to work on problems/homework. There should also be more extra credit opportunities.

9. The homework didn’t seem helpful sometimes.

10. no way

11. I don’t really know how to improve it.

12. I felt that the assignments weren’t always clearly posted.

13. The professor needs to make sure students understand what she is teaching. Sometimes, students are confused about what is going on and the prof keeps talking and talking.

14. true or false seems not related to solving problems but just memorizing terms

C. Instruction

5. The professor was well prepared for class.

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6. The professor used teaching methods which helped me learn.

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7. The professor was available for help outside the classroom.

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8. The professor seemed genuinely interested in teaching this subject.

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9. Please rate the professor's overall performance in this class.

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Explain why you gave Felicia Tabing this rating.

1. I understand that she is fairly new, and I am impressed at how well she is doing for being new. However, I think experience will make her explanations and examples more clear. I tolerated having the larger work load because it was necessary for the material to be learned in my case. I might suggest in addition to the previous stuffs, that she cut back on in class worksheets, because I found them very confusing and frustrating in their directions. The notes she handed out on the other hand were very helpful!

2. She was sometimes unsure of the questions we were asking or of her own work and it could sometimes confuse me. She did seem very interested in teaching the course.

3. As I stated before, you just seemed like you need to be more confident in yourself. I can tell you know your math very well, otherwise you wouldn't be teaching here, I don't think. Also, your own confidence will give students themselves confidence in your ability to teach them what they need to know.

4. There are certainly areas in which she could improve.

5. I felt like we could've done more examples in class or at least completed the ones we started. A lot of time was spent just copying the words down off our notes onto the board when we could have just read it off the paper instead and then used that time to do examples. If examples were not finished we had to find them in the solutions online and then try to figure out our homework problems. This took a lot of time.

6. During class she taught well but she only had one hour of office hours. This limited the time you could talk to her. Some topics could have been taught better by using shortcuts to make them more memorable. I learned a lot but i wish the material could have been taught in a little bit a more memorable way.
7. Helped me out greatly when I have struggled. Unique experience for me from a teacher. She knew I was not doing well in class, and after talking to me about my life in general she saw why. Kept me mostly in line in class.
8. The professor's performance was good overall. However, more could have been done to make sure the class understood the material better.
9. Dr. Tabing seems like a promising professor, but it seemed like she didn't really catch on to when the class was just hearing what she said instead of actually listening. There were some moments in class where no one got what was being taught but she just continued on with the notes and didn't wait for the majority of the class to catch up.
10. The course was very difficult for the first 4-5 weeks. We reached the midterm and it seemed like a lot of students were struggling in the class. She offered a midterm professor evaluation and it seemed that she changed her teaching method from there on. She better presented the information and made it much clearer what we needed to know.
11. She was always available to help outside of class. She printed off note packets for each class, and she always made sure we had time to ask questions if we needed.
14. Professor Tabing just didn't help me at all. In class her methods of explaining material just don't work for me, and it especially doesn't help when she doesn't even understand how to answer a question.
15. Dr. Tabing really tried to teach this course well, but her style of teaching didn't match up well with the way I learn.
16. The only thing that can be improved is having the students write their own notes because, personally I learn better that way and this forces the student to pay more attention. I wish there was more homework given because I think that would've improved my grade in the long run, but all in all I learned a lot and I wish I would've came and asked for help rather than trying to figure it out myself or ask a friend.
17. She is a good teacher but still can improve a lot.
18. She always wanted as to come see her if we needed help and did helped us well
A. Learning

1. Please rate the quality of your learning in this course.

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<thead>
<tr>
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<th>Satisfactory</th>
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Explain why your learning was at this level.

1. Some things seemed a bit jumbled up. Although this can be refined through experience.
3. Some of the lectures felt all over the place and were occasionally difficult to follow.
4. After Dr. Tabing's midterm survey she made significant improvements to the class and it helped a lot
5. I have already taken the equivalent course in high school, and didn't really need to learn much. Basically just a review personally.
6. I learned a lot about integrals and how to use them in this class. I feel like everything we needed to know was taught.
8. Instructions were not very clear, and often times explaining in depth material that was not relevant, while others times the important subjects where covered too quickly.
9. Notes were provided so it was easier to pay attention in class rather than frantically taking notes. Dr. Tabing was very open to questions and would explain everything she did if someone was confused.
11. I have a good understanding of the material
12. I do not feel like I learned much in class. It seems like more learning was done by asking other people or looking on the internet. I still attended class every day, but I feel like the material was not covered very productively in class.
15. I did not understand most of the material throughout the course.
16. Dr. Tabing is very helpful and is committed to our learning.

B. Course
2. The laboratory assignments and course material reinforced one another.

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<thead>
<tr>
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3. The work load for this course in relation to other courses of equal credit was:

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4. Overall, how would you rate this course?

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Describe one or more strengths of this course.

1. The notes were definitely on point. I enjoyed going to class and Dr. Tabing was always fair to the class. Dr. Tabing also seems to enjoy mathematics very much and i very much appreciate the fact that she enjoys her job. Every time we took a quiz there was a nice drawing or a col math fact that made me smile, it shows characteristics of a teacher that genuinely enjoys teaching which i 100 percent approve of.

3. There was homework every couple nights to allow for more practice with the material.

4. The extra credit helped a lot, and Dr. Tabing's in class examples and homework helped me learn the material.

5. Covered material completely, did not feel like we had to rush through material.

6. This class did a good job of teaching the basics of integrals and applications of them.

8. Was always ahead of other classes, and allowed group quizzes.

9. The note packets were very useful. It was nice to be able to have a note sheet for the exams; when studying, I was able to focus on the application of the equations/theorems rather than exactly what every formula was.

11. Lots of homework and practice to understand the material.

12. This course had enough homework to sort of know what kind of problems are expected in exams and quizzes.

15. Lots of opportunities for projects.

16. The professor assigned homework that well reflected the difficulty of quizzes and tests. This lead to good preparation for tests and quizzes.

Describe one or more ways this course can be improved.

1. Sometimes the information given out was a little bit confusing. Long awkward pauses maybe because of intimidation? The class didn’t participate that much during discussion which is hard to do about and that can effect the whole class. Also, sometimes the information Dr. Tabing was giving out didn't go along with her plan, although she got a hole lot better towards the end.

3. The hand out notes didn't help me personally, I am able to learn better by writing out and following along, with the hand outs, this made it easier for me to slack off on note taking and my focus wasn't all there.

4. More examples than theorems and definitions.
5. The course itself is good.

6. This course could be improved by giving harder examples in class that are like book problems.

7. Evenly distribute homework and projects better. There was one week we had something due everyday, while the next we only had one assignment.

8. Office hours need to be open when they say they are, if not rethink office hours. Provide any review sessions or final review session in class instead of playing domino’s with limits and integrals. Use new teaching methods to illustrate to students, as the current teaching style is very difficult to follow.

9. I think that Dr. Tabing was a very good teacher, being that she does not have much teaching experience. I think that with more experience she will be a very good teacher and just needs to focus more on being relatable to the class and making sure that everyone is engaged and understands the material.

10. More explanation on the more complicated theorems and rules

11. There was such a heavy work load that at times it was too much with other classes work as well.

12. Get rid of the printed notes. While I appreciate the sentiment and work thought goes into writing our notes for us, I would like to take my own notes. This is because I understand material when it is in my own words. Plus, having to take my own notes forces me to pay attention in class.

C. Instruction

5. The professor was well prepared for class.

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6. The professor used teaching methods which helped me learn.

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7. The professor was available for help outside the classroom.

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8. The professor seemed genuinely interested in teaching this subject.

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9. Please rate the professor's overall performance in this class.

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Explain why you gave Felicia Tabing this rating.

1. I feel that Dr. Tabing will be an excellent teacher in the near future. Some things she tried to teach were very complicated to learn but towards the end she nailed it. Over time she can improve her teaching techniques. I hear around and people are very judgmental about her class, however, found it very enjoyable.
2. Dr. Tabing tried her best to teach the class well, but did not explain it in a way that we could understand.
3. The lectures were always well prepared and planned. The notes were handed out to follow and fill in, although this strategy aids in allowing some students to feel that they can refer back to them for help, the hand outs occasionally allowed me to feel that I didn't need to take as many notes, and in turn, I did not learn the material as well as I could have.
4. Dr. Tabing was a great teacher.
5. She is a good teacher, but focuses too much on proofs and definitions and theorems. She explains everything in a technical way. Some material needs to be explained in a way that someone who is just learning can understand. Most of the notes only cover basic examples and don't show the harder problems, and make it hard to reteach yourself when doing homework. They are also very technical. You can't review notes that you don't understand to begin with.
6. Dr. Tabing did a good job teaching the material in class and gave examples that helped. Her tests and quizzes were fair with extra credit opportunity on all of them.
7. Sometimes goes to past.
8. Dr. Tabing, although new lacks experience under a veteran teacher. Her methods are less than standard and often leaves students confused. Every time we have a substitute, we learn more than what she taught us. Secondly her office hours are never open, since she has excuses of why she has to leave early. Although she is very intelligent and excited to teach the material, it often comes out in little bits and pieces leaving students to make a very loose interpretation and connection of what she wrote on the board. She is always willing to help students out, but often rushes through the help a student often just feels lost after the explanation.
9. She was very interested in the subject and knowledgeable about what we were learning. For being early in her teaching career, I think she did very well and will be an excellent professor in the near future.
10. She did a good job of explaining the problems and she had study packets for us to take and use which were a big help when we got stuck on homework or projects.
12. I really did not connect with her teaching style at all. She teaches off of a notes sheet that she hands out at the beginning of class and writes off it word for word. She does examples that are not practical to our homework or exams. We learn how to derive theorems not use them. The practice exams for this class are pretty easy to understand and follow, but then the real exam comes and it may as well be completely new topics. I was not really happy with this class, I feel like it was more of a struggle than a learning experience.

15. I did not feel like I learned well from Professor Tabing, she was always available for office hours but even when talking to her in and out of class I never felt like she clearly answered my questions clearly. Also sometimes I felt like she skipped over a lot of material including examples she had written out but wouldn't finish.

16. Dr. Tabing is a good professor and I would recommend her as a prof to any student. She was well prepared, sent out constant reminders about assignments, and was always willing and available for help outside of the classroom.
A. Learning

1. Please rate the quality of your learning in this course.

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<thead>
<tr>
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Explain why your learning was at this level.

1. Lecture goes smoothly and isn’t boring
   handouts supplement lecture
   worksheets, quizzes and other in class interactions benefit learning
2. I think I know what I’m doing.
3. Course moved too quickly for me. I had not seen very many of the concepts prior to this class.
5. No offense to Dr. Tabing, and I hope she does not take this review personally, but she is simply a bad teacher. Her lectures are almost impossible to listen to because of her discontinuous speech (filler words like “umm” and long pauses in speech when she is trying to walk us through a proof or something, and often she will start to say something, trail off, and then begin saying something else without ever finishing what she was originally saying). Many of her classes consist of “just do this worksheet and turn it in at the end of class, or whenever,” and I would rather be getting taught something during class time rather than working on something I could do at home. The benefit of us doing the worksheet in class is that she is there to help us, I get that, and it is not a bad idea, and it would work if everyone did not have questions at the same time. Instead of us doing the worksheets ourselves, we stare blankly at the sheet until she finally gets to us to answer our question. This is no way to each in lecture. Instead, I suggest we go through more examples as a class, and have Dr. Tabing solve the problem the way she would solve it, rather than waiting on someone from the class to attempt to solve it. With students seeing Dr. Tabing solve the problem “her way,” we would not only understand how to solve the problems ourselves, but we would also see the way she would like her problems solved. When she waits on students to solve the problem, it wastes class time while the student musters up the strength to speak up, and other students in the class have a hard time hearing the reasoning behind that student’s answer. If Dr. Tabing were to do some examples herself, I feel as if many of these problems would be resolved. But she still needs to work on smooth, uninterrupted speech so her students can follow what she is trying to convey to them. Also, she needs to work on limiting her typos on things like tests and solutions to worksheets on Moodle. I found it ironic that her big paper, the Fibonacci paper, was so big on NO TYPOS but most of her stuff has at least one typo. In order to pass my third exam, I studied for two straight days using only the book (not her notes). I did better teaching myself the content rather than depending on her lectures. And that is not how it should be. There is not a doubt in my mind that Dr. Tabing knows what she is teaching, and I am sure she is very well qualified for the position she currently holds here at this institution, but she does not do a good job transferring that information to her students.
6. Lectures were VERY disjoint, it felt like the notes packets were simply rewritten on the board. I had little reason to pay attention as everything was already completed in the notes packet. Many times the class notes omitted something essential for solving some of the problems, and it needed to be looked up in the book, which sort of defeats the purpose of handing out notes packets in the first place. The fibonacci paper assignment seemed extremely irrelevant, as I don't think learning LaTex to be a crucial goal of MA-275.

9. Dr. Tabbing is one of the worst professor I ever had at rose. She gave confusing lectures and redundant homework.

10. The course in all was great, I learned a lot of concepts and theorems there. Dr. Tabing is a really good instructor, that she answered questions carefully and precisely, she gave responses to our homework quickly, and she gave fair exams as well.

11. I learn well and get nice score

13. some of the material taught was confusing

14. I knew virtually everything that the class covered prior to taking the class

15. This class had the worst professor I’ve ever had here.

16. I am still a little confused on some parts of the class

B. Course

2. The laboratory assignments and course material reinforced one another.

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<tr>
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3. The work load for this course in relation to other courses of equal credit was:

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4. Overall, how would you rate this course?

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Describe one or more strengths of this course.

1. I understand new concepts of counting now

2. Dr Tabing is available for helpful all the time.

3. I learned more about discrete math.

5. The Fibonacci Paper, which is the only "laboratory assignment," does relate to the course in that we have to write our own mathematical paper, and is useful to know how to do.

6. The textbook chosen for the course was very well written, as I had to spend a lot of time reading it to understand what was going on in class.
11. We learn math method to deal with the logic, it is fun.
13. Taught important principles of math
14. Provided a good foundation for higher level math
15. It could be a fun class.
16. The material was mostly easy to understand and well presented. I really enjoyed the ways we used it to find statistics and things like that.

Describe one or more ways this course can be improved.

2. Dr Tabing will get better at teaching, I believe in her.
3. Create more of a connection between logical equivalences and proofs. It seemed like we never referenced logical equivalences when we began to write proofs. I still struggle to find the correct framework when I need to write a mathematical proof.
5. I said that the work load was "much heavier" because I needed to teach myself just about everything on top of an already "heavier" class. See first comment for ways the course can be improved.
6. Lecture. Don’t read me the packet that you’ve already handed out, that’s useless. Rewriting it on the board accomplishes nothing for anyone, as all of the solutions are already written...
7. too much worksheets and and problem solving on class. The instructor could spend more time on explaining instead of solving example problems
11. I have no idea about it.
13. more focus on how to write proofs
14. Do more material at a more advanced material. Everything was too easy and the class moved too slowly
15. Hire a better professor, switch to a better textbook, and be done with course material by the end of 9th week.

There were two things I didn't enjoy with the textbook. To start with, it wasn't really understandable. I found myself being confused when trying to figure out the concepts it was trying to convey. Second, the homework problems were way too dense. When you reach part h.) in problems, you begin to wonder why they aren't split up.

16. I had trouble with the last chapter of the course and think more time should be spent on functions and the fundemental theorem of algebra.

C. Instruction

5. The professor was well prepared for class.

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6. The professor used teaching methods which helped me learn.

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7. The professor was available for help outside the classroom.

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9. Please rate the professor's overall performance in this class.

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Explain why you gave Felicia Tabing this rating.

1. Dr. Tabing’s lectures are good very helpful giving individual attention when class is working on worksheets
2. Dr Tabing is so helpful and funny outside the classroom.
3. I ended up having to spend a lot more time out of class learning the material than I did for any of my other classes.
4. See first comment.
5. Dr. Tabing’s structure of the class was almost non-existent, and there was a constant disjoint feeling going around myself and students sitting near me. VERY hard to follow the course without reading the textbook.
6. To be honest, I really don’t like how Dr. Tabing teaches courses. Gives out too many homework or worksheets, could spend more time explaining materials in a better way.
7. Dr. Tabbing can’t really explain things. She sometimes cannot explain her proof. Assign lots of homework, most of which are redundant and useless. Maths paper is even ridiculous. Why would a ME\CS major have to write maths paper? MA275 should be a easy course, but Dr. Tabbing successfully made it hard.
8. Dr. Tabing is always ready to teach her students new things, she is always around and being really helpful. She knows what she is talking about in class and can always be there and help you out.
9. Dr. Tabing can explain the theorem clearly. Her examples to solve the problem are easy to understand.
10. Professor Tabing seemed like she had an interest in the class and having her students do well but didn’t always explain things in a manner that was easy to follow.
14. She makes many mistakes when doing example and does a poor job of explaining them. I think that if I didn't know most of the material before taking the class, I would have struggled. Additionally, she seemed very unenthusiastic about most of the course, often saying that she never used whatever we were leaning in her field.

15. Hands down the worst professor I've ever had here at Rose.

The main issue that is comes down to is not that she doesn't know the material, it's that she does a frustratingly bad job of bringing the subject down to a beginners level. During the first few weeks, she aimed the lectures towards the class average of prior disco knowledge. The problem with this method of lecturing is that if you were below that average (like me), you were left more confused coming out of the lecture than going in.

It also doesn't help that she seemed uninterested in teaching the subject. We had a substitute come in on one the last few days, and I think I learned at the fastest rate on that day than I had any other day with Tabing. The key differences between that sub and professor Tabing was that the sub had a positive "math is exciting!" attitude, and the sub took silence as "We don't get what you're talking about" instead of "We get it and aren't confused at all." I still don't really know how to go about proving things, but at least that sub gave me some actual tools to help guide me through writing one.

Another issue I had was not knowing the expectations for certain procedures. There were more than I few times where I got points taken off for doing a problem correctly, but with the wrong syntax. Compounding on this, there wasn't a lot of feedback on turned in assignments. Yes I now know that I got it wrong, but what were you expecting so that I won't do it wrong again?

Continuing with my laundry list, another problem with Tabing was grade inflation. Really? Having partner quizzes? I mean it was a nice gesture, but when it got to the class dropping deadline, I couldn't convince myself to drop the class because I was at a B. Looking back on it, I think I should have dropped since this final is probably going to wreck my shit.

16. The teacher really helped us personally when we were struggling and was able to help the whole class through the lectures and giving examples based on questions we asked.
A. Learning

1. Please rate the quality of your learning in this course.

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Response Rate: 21 of 21 (100%)

Explain why your learning was at this level.

1. I wish series were explained more clearly, because I'm still not quite sure what a Taylor Series is supposed to be. But other than that I feel that everything was explained very well. The homework load was enough to feel like I’m learning, but not so much that it feels like busy work, so I think you found a found a happy medium in that regard. You definitely seem like you enjoy what you do, which makes your class a lot more enjoyable.

2. Prof Tabing was very hands off and allowed us to learn on our own. I felt that I learned better and did better on texts.

3. I definitely feel like I learned a lot from the course. There are still some topics I’m a little uncomfortable in but I feel that’s more a result of my misunderstanding less of the course not covering the material.

4. i feel like i learned but did not fully grasp the subjects as i do not remember some of them.

5. I had a basic calculus background, but lacked some fundamentals. Felicia was extremely helpful in reinforcing calc 1 concepts while adding calc 2 things as well. Additionally, I received exceptional help when going to office hours, or by even sending an email when outside of the class.

6. Overall the course went fairly well. However, it was a learning curve for all those involved and I take that into account while filling out this evaluation. In the beginning I was not at all a fan of Felicia, but as time progressed, I saw her try to improve and she did so successfully. She is great one-on-one and I never had a difficult time getting in touch with her outside of class when I needed her assistance. However, I don’t rate this class any higher because she still needs to improve in the class room, which I can see her doing steadily.

7. She has really improved throughout the year and once I got used to the style of teaching it really helped me to understand both the concept and application of the material.

8. Overall I learnt the gist of it during the actual class period but more of the actual application was much harder to understand but I was able to meet up with Felicia most days, outside of the class, that I had trouble which allowed me to understand the material in this course.

9. Topics were thoroughly covered during class lectures and full note sheets with example solutions were provided for every section to help comprehension of each topic.

10. The teacher was very good at teaching the material and preparing us for the in class tests. The homework was not too abundant, but on some occasions was a little too much.

11. Other than sequences and series, I felt like this course actually did a good job of teaching.
12. Teacher spends necessary amount of time teaching subject matter.

13. Prof would answer emails promptly and explain everything. Material covered in class was typically much easier than the homework, but questions would be answered in class. Homework deadlines were lax, which also made life easier.

Notes started to be handed out halfway through the class. This saved a ton of time, as before she would write out every definition, which greatly slowed the pace of the class.

14. I believe I learned a lot from this course. I previously had learned this material in high school but this course went much more in depth and the pace at which we learned the material was very challenging.

15. The material was presented in a way that was fairly easy to comprehend, but the material itself was very confusing and hard to understand at some points, especially sequences and series.

16. The instructor lectured more than taught. As a learner by examples, I found it incredibly hard to learn when only a few examples were provided in class. The instructor also handed out several packets and lectured to us rather than explain steps to find the solution.

17. For many new topics, I felt like it was hard to understand the basics because we always jumped right in to the main idea of the topic. This always seemed to be cleared up after we did a few examples or after I did the homework, and Professor Tabing was always helpful during office hours if it took me a little more time to understand a concept. I would have liked a little bit more introduction into new topics to understand what it is that I'm going to be learning about.

18. The material was taught thoroughly. This did cause less examples to be showed in class though. It would be nice to have a wider array of possible applications of the material being learned that day. The professor was willingly and able to answer any questions asked and explained the solution in understandable ways.

19. Professor is very helpful.

20. The learning atmosphere is not that serious. It is fun to take this course. However, I think a few of material are not explained fully.

21. I took Calculus BC in high school, so this class was somewhat of a review to me. However, it was a very good refresher of integration techniques, which I had forgotten a bit about.

B. Course

2. The laboratory assignments and course material reinforced one another.

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3. The work load for this course in relation to other courses of equal credit was:

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4. Overall, how would you rate this course?

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Describe one or more strengths of this course.

1. Most of the material was taught very well.
2. The amount of group projects allowed us to socialize about math.
3. The course covered great topics in a way I felt I could understand. Having us learn sums and series at the beginning of the course was a little confusing and it left me a little forgetful of them at the end before the final but as long as they're reviewed towards the end of the course I think things would be fine.
4. The class had a good learning environment, and the teacher was really nice and tried to help us learn.
5. In comparison to previous math courses, actively doing examples when going over the notes helps me learn material. This is something I wish more teachers did. Additionally, Felicia allowed us to use the first few minutes to go over homework questions, which was very useful for the tougher problems on our homework.
6. In taking this course, I found that getting in touch with professor when I needed her outside of class was a strength as well the encouragement of asking questions in class.
7. Good use of in class lecture time and then assigning a very reasonable amount of homework that was very helpful in preparing us for quizzes and exams. The exams were not too hard or too easy and I think will help my performance on the final.
8. The way it was set up learning sequences and series at the beginning and then building up on everything from there.
9. The teacher taught what was needed and made sure everyone understood. She was also there for her office hours if anyone needed more help.
10. It is very good at explaining the intermediate levels of calculus.
11. Teaching pace is excellent
12. The best part about this class was that homework was assigned early and could be turned in late. This meant that one could plan ahead about when to do work, which is great for a math class. The alternative would be forced to do everything all at once, which is not great in a hard class.

The work done in class was quite nice, as it allowed one to check how they were doing immediately.
13. The course's strengths were that it was very challenging while at the same time not being impossible. The tests were extremely fair and it was extremely clear what material would be covered on each exam and how this material would be asked.
14. A lot of the topics based on integrals built on the topics from Calc I pretty well.
15. The strength of this course was the pace of the class.
16. I was introduced to a lot of new ideas. Although I have not mastered them all, they will be familiar to me as I move into higher level math courses.
17. It provides a great starting point of how much work is needed to put into classes. With it being one of the harder gen ed classes, this course helps to prepare students at the start on how Rose will be like.
18. The professor is helpful.
19. It gives us the project to measure the volume which enhances my ability to calculate the volume.
20. It covers a lot of material that is useful in other classes, such as higher calculus classes and physics.
Describe one or more ways this course can be improved.

1. Spend a little more time on the Taylor Series.
2. The material is difficult and annoying at best.
3. Bring back a review of sums and series at the end of the course to remind students since it was covered at the beginning of the course and may have easily been forgotten.
4. The reinforcement of earlier topics kind of slacked off towards the end of the class in the increased use of maple causing me to lose some information, so maybe some reinforcement of earlier topics later in the course could be used.
5. I think the course overall would be more effective if we could access a lecture before the class, and then have time in class to do the homework. Reverse classroom would be substantially more effective for this type of math course.
6. In my opinion, the professor should explain each step when doing an example problem on the board. There were times when she would not show work for simple shortcuts which would cause confusion. This could easily be avoided if, when doing the first example problem, she took into account that some students may not see the shortcuts immediately which causes problems when learning the new material.
7. At the beginning of the year, she was not completely sure as to how to present the material but throughout the year got significantly better at explaining what she meant. I think she can be too smart for her own good when trying to explain the material to some students who are struggling.
8. Little bit less homework especially when there are projects due.
10. The teacher could do more examples in class rather than taking all the time to prove the theories being used.
11. Just as a nature of how the quarter systems work at Rose, the class is kind of fast paced. I don’t know how this could be improved, maybe more review days?
12. Have more time for homework questions in class, sometimes not everyone gets all their questions answered
13. Make the examples in class be of a similar difficulty to the problems in the homework.
14. I believe the course can be improved by doing series and sequences at the end of the course rather than at the beginning. I think a sturdy background in integrals can help understanding of series.
15. One major improvement would be to start with the integral topics, which build on the topics from Calc I, and then introduce sequences and series towards the end.
16. This course can be improved with more use of maple, or even teaching how to use maple. And by showing more examples in class so as a student we know that we can actually perform the principles taught.
17. This course could be improved by covering less topics so that we could have a better understanding of the topics that we are taught. There is too much information crammed into a short amount of time.
18. Describe more ways a theorem can be used than just the basic so application is slightly easier on homework and tests.
19. Everything is great.
20. Review constantly. In the end of the quarter, it is hard for me to remember knowledge about series.
21. I feel like sequences and series should have been covered at the end of the course rather than the beginning. Those seem like the most difficult part about this class.

C. Instruction
5. The professor was well prepared for class.

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6. The professor used teaching methods which helped me learn.

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7. The professor was available for help outside the classroom.

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8. The professor seemed genuinely interested in teaching this subject.

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9. Please rate the professor's overall performance in this class.

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Explain why you gave Felicia Tabing this rating.

1. She knows what she's talking about, enjoys what she does, and is always willing to help.
2. Prof Tabing did a decent job in class teaching us. Most students did well grade wise but I feel we are in trouble for the final.
3. Dr. Tabing was a great pick for teaching this course. She never went to fast but never too slow either. If a student didn't understand something she made sure to clarify and I felt very well prepared for every test.
4. she is really nice and fun to have class with, she needs to work on her basic math skills sometimes when working out problems on the bored but overall she is good and teaching.
5. Felicia is extremely passionate about mathematics. Her engagement made me more excited to learn. This being said, if I had one more piece of advice for Felicia, I would encourage her to work slower on the board, because processing new material (especially later in the quarter) is hard and takes more time to sink in.
6. Felicia has improved, and I believe she has potential. However, I did not give her a higher rating because she was not very good at first.
7. Definitely my favorite professor I had this quarter, she wanted us to succeed and was very willing to answer any questions we had. Her lectures were a good mixture of concepts and examples which was very helpful for me because it is harder for me to understand a concept without an example, I like to work through an example while still covering the conceptual material which I think is common for a lot of Rose students since we are engineers.

8. I was able to go see her almost any day of the week with any questions I may have had and she would help me to understand. Like one day with taylor series I sat with her for almost 3 hours before class. She always seemed happy and ready to teach.

9. Dr. Tabing did a good job of giving thorough lectures on each topic as well as provided excellent resources for studying and checking comprehension on a topic outside of class using her Moodle page. The resources she provided and made readily available really helped my learning during this course.

10. She is a great teacher. She was very straightforward about what she was going to teach. She would help anyone who did not understand the material. Also, she gave out a survey to she what she could do to improve the way she was teaching which helped us be taught in a way that best fit us.

11. The only thing I wasn't a big fan of is the days we went over material that we wouldn't be tested over or that we wouldn't see on the final. While I agree that this information would be nice to know, a day of review in class would be very beneficial to a lot of students who haven't quite learned how to study yet or what to expect on each exam.

As far as the sequences and series go, I don't personally believe there was a lot of learning there. As most calc students, that's where I struggled the most in this course, and I think personally it's from the amount of examples we got. We had examples, but once I got to the homework, I had no idea how to apply it to the homework and the examples on our practice didn't really help prepare me or others that I have talked to enough to do the more complex problems we were assigned.

Overall, I think Felicia did a great job adapting over the quarter, as when she started handing out notes that and adding problems for us to work on that included stuff from the notes on the actual notes page its self, I found that my understanding of the current subject matter got better and was much easier to apply to the homework. I feel as if this method was applied at the beginning of the quarter to sequences and series, I would have done much better in the section.

12. If there was ever a chapter that I felt unprepared for, after asking questions in class, I felt comfortable with the material.

13. She would respond promptly and quickly to questions, and was great about putting assignments online. The downside was that some days and assignments seemed to be wasted on covering easy material. I don't believe the class needed to spend half a day explaining the trap rule, but half a day on taylor series would be appreciated.

Projects tended to be annoying, I did not like them much.

Going over physics to the extent that she did was kind of unnecessary, by the time we got to work I believe we already covered work in physics, so I don't think we need to know the specifics.

14. I believe that throughout the course Dr. Tabing was always prepared for class. The note sheets that she handed out to supplement the curriculum were extremely helpful. She always made sure that everyone knew her office hours and could come to her for help. She was quick to respond to emails and was very helpful in her responses.

15. She was fairly enthusiastic about the material she was teaching and taught it in a way that was fairly easy to understand. On occasion, she would lose track of what she was doing, but for the most part the lectures were easy to follow.
16. As mentioned before the instructor lectured more than taught the lesson. Also that she didn't always fully explain problems, but rather glossed over steps made it harder to learn the principles being taught. She was prepared with packets, but sometimes the packets weren't as helpful as they could have been. The packets often jumped from an easy question to one that seemed impossible. Overall Dr. Tabing was a good professor, but not a good teacher as in she lectured more than taught.

17. Felicia cares and is willing to put in effort to help any student if they are willing to seek the help. She is also very enthusiastic about what she is teaching and is always nice. If there were ever any areas that it seemed like the class as a whole was having a hard time understanding, she would slow it down and make sure we practiced the topic more.

18. She explained material very well and provided answers to questions whenever asked. She made sure to try and not overload us with homework and understood that other courses took up time up as well.

19. She's a helpful professor.

20. She is nice and will offer help when I have problems. She can talk to us like a friend and will listen to our advice.

21. She is very good a teaching, however I feel like she could be more engaging with the class.

D. Review

Comments from Felicia Tabing

Faculty member's response to student comments:

Something that stood out in my student’s comments was about how I improved throughout the quarter. I didn’t realize how pronounced this was, but this was probably because I was learning about them and adjusting to them. Initially, I treated them like how I did with students in the past and went really slowly and assumed not that much background, which is not the case for Rose students. I think the improvement they noticed was my adjustment to them, and also just to Rose. I also gave them mid-quarter evaluations to possibly adjust the course if something wasn’t working for them, and one of the main thing that they all wanted was copies of my notes, so I started handing out copies of my notes with blanks left in the examples that I would work out, so they can fill it out themselves and work them out.

I think another thing my students struggled with was the lack of review or integration of the sequences and series material. I think next time series is taught at the beginning, I will try to integrate it with the later material, and possibly do what I saw Josh Holden do for his exams and put series on every exam.

There were also a lot of comments on how I seem to enjoy teaching the material. I am also glad that my enthusiasm shows through in my teaching. I know from my experience teaching before that this was usually a positive trait, but it was really exciting for me to see comments this quarter on how my enthusiasm for this course made it enjoyable for them to learn the material.

Several students mentioned benefitting from more examples. This is something I struggle with in choosing examples, because I need them to be brief to fit them in class time, but also I want them to demonstrate something in particular. It often ends up that the homework has problems more difficult than the examples, but I find that giving a hard problem that
takes a long time does not get my point across.

Student 4 said “she needs to work on her basic math skills sometimes when working out problems on the bored,” which I do admit I have a problem with. There is something up with my brain that I find it hard to do basic arithmetic, so sometimes I have these really small mistakes on the board. How I usually handle it is I hand off the arithmetic problem to them and usually they shout out the answer a few seconds later. I actually like admitting to them that I can’t add or multiply so that they know I’m not perfect and people have their weaknesses, but sometimes it is an issue. I think I received this comment in a past evaluation, about my arithmetic errors derailing the course, but I think it works fine with Rose students.

Student 13 said they thought the projects were annoying. I guess there are mixed reviews about this. This was something I was looking for in their comments because I was wondering how effective they were. I meant for them to be a fun way of incorporating Maple and calculus and doing something lightly applied, and I do think a lot of them did have fun with it. The quality of the projects were amazing, but I did hear a student mention that he did the work for his project that same morning, so I wonder if the annoyance towards these projects were their lack of time management.

Student 13 also said, “Going over physics to the extent that she did was kind of unnecessary.” I explained everything because I guess I assumed that they are like me and don’t have much of a physics background, but after going over this stuff, they were very familiar with it. I am on the fence about whether I should continue explaining the physics material in as much depth as I did.

Overall, I think they got the sense that I am pretty sensitive towards them, in that I know when they are lost and when I need to slow down, or when I need to change things to accommodate them.

I originally wrote a much more detailed response, but it didn’t fit the limits.

**Things beyond the control of the instructor which influence the evaluation:**
I am not sure if this was totally out of my control, but I taught sequences and series first to go along with what Josh Holden and Sylvia Carlisle did, and I’ve never done this before and I really wanted to try it too. If I didn’t like the idea, I could have not done sequences and series first. But I think this was the main source of difficulty for the students, as it is clear from their comments they thought it was hard, or they wanted it last in the course.
A. Learning

1. Please rate the quality of your learning in this course.

<table>
<thead>
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<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>4.35</strong></td>
<td><strong>.59</strong></td>
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</table>

Explain why your learning was at this level.

2. The pacing of the class generally worked very well, and Professor Tabing explains mathematical concepts well. She had good answers for any questions I asked, and we spent plenty of time going over concepts few people understood the first time.

3. Relearned some stuff from Calculus I and started learning some new stuff about Calculus II, like the Shell theory for finding the volume of a solid.

5. I learned new things about Calculus

6. This course was very good. Dr. Tabing is an enthusiastic professor and it really shows. I learned a lot in this course and feel like I'll retain most of it too.

7. Because Dr. Tabing explained most material in more than one way, so most students understand her lessons.

8. We did lots of examples in class to help students understand the content taught. Dr. Tabing was very helpful and willing to answer questions and taught in a manner that was easily followed and understood.

9. I was able to get help immediately after class if I had had trouble on the homework due that day or did not understand what was taught in class that day.

10. Professor Tabing did a good job putting examples up on the board and worked through them once we were given a chance to attempt it.

11. Great teacher, and teaches great.

Offers adequate help for anyone who asks, explains concepts so they are very easy to understand, provides homework that is relevant, but not unnecessary busy work.

All of these together end with a great learning experience.

12. I had already learned a lot of what we went over in this class, however, whatever new material we did cover I understood very well.

13. The professor was excited to teach everyday and always took students' feelings and opinions into consideration. If she was going to fast and a student had trouble understanding a problem between steps, she would stop, go back, and ensure that all confusion was cleared up. For the most part the material was presented in a concise and productive manner.
14. Overall, I learned the material and how some of it can apply to real-life situations. Even better, I understood it after practicing it and on the exams.

15. Dr. Tabing is a phenomenal professor with a gift and passion for teaching. I do not know how I would have made it through parts of this class without her help.

16. It was mostly reviewing things I already knew how to do.

17. Pretty much just my fault. Dr. Tabing was excellent, but I got bogged down with personal stuff so I didn't get as much out of the class as I could have.

18. The majority of the course was a review of things I learned in AP Calc AB, so I was able to pretty easily keep up with the lessons.


20. Dr. Tabing is the only professor I have right now who can relate complex topics in a way I can understand. Her tests are challenging, but not overly so, and the amount of homework she gives is perfect. On top of that, she is a very nice person and is genuinely fun to be around.

B. Course

2. The laboratory assignments and course material reinforced one another.

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3. The work load for this course in relation to other courses of equal credit was:

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4. Overall, how would you rate this course?

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Describe one or more strengths of this course.

1. I liked having the sequences and series at the beginning of the course. Even though it made the course very hard at the beginning, I appreciate it now because my other courses were easy then and got very hard now.

2. I enjoyed the real-life activities we did (such as the spring experiment and volume estimation). They helped me appreciate how calculus fits into the real world. I also liked having printed out notes; it made it easier for me to follow along in class, without worrying about having the crucial pieces of information written down.

3. I enjoy the handout notes, for the class since it allows us to read over exactly what she has said and her office hours are very open.

4. I thought that our prof was pretty good.

5. I like how the structure of the class is set up. Also the quizzes and exams correlate with what we've been taught.
6. Dr. Tabing. She is an enthusiastic teacher and obviously loves what she's doing. Also, the projects were really cool. Both the leaf project and calculating the volume of a body project were good breaks from the mostly theoretical math we'd been doing.

7. She shows were the equations and theorems come from.

8. The professor was very helpful and made sure everyone understood the material and helped if they had questions. The homework being spread over a few days and having chances to ask questions about it was also a plus.

9. I could get help very easily. The professor is approachable and office hours were given at the beginning of the year and (pretty much) every day.

10. notes always helped me out with the homework, and Professor Tabing was always available.


12. The teacher was very straight forward about the class and the material, and it is not extremely hard to grasp. I felt as if I understood everything fairly well.

13. Printing out notes, this way the student wasn't fumbling to copy the word parts and was able to simply read and focus more on writing the proofs/examples. Also it allow the teacher to write at a faster pace for text, but slower pace for examples.

14. It all connected well together and I was able to grasp the content once I knew how the class itself was structured better. The homework also really helped me to learn the content.

15. Dr. Tabing's teaching ability. Also, I feel that she typically assigned homework problems that were harder than the ones on the quizzes and exams, which I thought was really good. Her class notes that she passed out with example problems were extremely helpful too.

16. Forcing students to use critical thinking and problem solving strategies.

17. Dr. Tabing is very accessible, clear, and easy to understand.

18. It was nice to start off with the Sequences and Series portion before diving into more of the topics that were review for me. It allowed to me to get a good grasp on these new concepts and then have a bit of an easier time with future material.

19. There is a lot of homework, but not trivial.

20. The pace was just perfect.

Describe one or more ways this course can be improved.

1. I didn't like the volume project at all.

2. I liked having sections of the test in which I only had to answer some of the questions correctly to receive full credit, but I feel this created a disincentive for me to learn how to solve any type of problem that could appear on a test. The general concept is good, but sometimes it made the tests a little too easy.

3. Nothing I can think of.

4. Don't do sums and series in any way, shape, or form. That stuff is terrible.

5. It would be nice if there was more time on the different types of integrals.

6. Having series at the beginning was weird. Having integrals be at the beginning of the quarter, where they're still fresh on everybody's minds from high school, and then having series could be better.

7. She can do more example problems.

8. The course could have a little more focus on the concepts rather than just examples. The theorems and definitions were gone over in class but not really talked about again in detail.
10. Pick out a few specific and challenging homework problems that cover the whole section and concepts, rather than a lot of problems with varying difficulty that may not cover the concept as well.

11. Series and sequences should be streamlined, possibly by having an ending "what you use where and how" lesson at the end of the section to wrap up all of various rules we learned.

12. Way too much homework. Homework is necessary to understand what is taught in class, but our professor went way over the top with the amount of homework assigned.

13. Better explanation of sequences and series in the beginning. Definitely the most difficult part of Calc 2 and could use a bit more practice and explanation on what exactly they are. Looking back I know understand this topic but there were a few details that were left out in the beginning that could made it easier (you just take the limit of a sequence to prove convergence or divergence vs. multiple techniques for series, I have seen flowcharts that are very easily understandable that would be very useful to most students.

14. During the first two weeks, it took a long while to understand the concept of series and sums, but it was clarified better later on. That part was just a bit overwhelming at first and so I did not learn it as well the first time around.

15. I cannot think of any ways it could be improved.

16. The whole course could be formatted in the same way as the last few weeks, a handout, then teaching and problems. This seemed most helpful.

17. It is a bit unclear how each topic sequences with the next, so the curriculum can seem a bit cobbled together at times.

18. There was a lot of homework in this course. On the one hand, so much practice was helpful, but on the other hand, I felt a huge struggle in trying to keep up with it.

20. It might be beneficial to hold review sessions, or give handouts in the middle of the course covering all the material we learned up to that point. That way, we don’t forget things we learned at the very beginning of the year so easily.

C. Instruction

5. The professor was well prepared for class.

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6. The professor used teaching methods which helped me learn.

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7. The professor was available for help outside the classroom.

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<th></th>
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8. The professor seemed genuinely interested in teaching this subject.

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9. Please rate the professor's overall performance in this class.

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Explain why you gave Felicia Tabing this rating.

1. She is a good teacher. I really liked that she started having in class follow along notes and posted the solutions later.
2. Professor Tabing, besides giving lectures well, is very approachable. I knew that I could afford to make mistakes while learning, and that I'd have my professor's support. She is genuinely interested in making sure we learned the material, and is obviously interested in it herself.
3. She is always involved in helping us and answering any questions we would have. She also prepares us for tests well by having us take mock tests.
4. I think that she does a great job teaching us what we need to know. She was always around when I needed help, and didn't pile on too much homework, which was really nice.
5. She's very nice, very approachable, and she is able to help us understand the material right after class is over. Also she is very flexible which is very necessary for a lot of students at Rose since we are involved in other activities and classes.
6. It's obvious that Dr. Tabing likes math. She does a great job teaching it and is enthusiastic throughout. However, she does seem to get distracted easily. Once she goes off on a tangent, it takes around 5 minutes to get back on track. Dr. Tabing hands out worksheets that have all the notes on them which is really appreciated, as that way I have duplicate sets of notes so I can go back and double check the other set of notes if I ever have any questions.
7. Because she is a good professor that knows what she is talking about. She also takes in criticism to help her get better teaching methods.
8. She is a very social person who seems to really enjoy math and teaching. She is always helpful and available when requested. Would love to have her again.
9. The professor would explain topics in greater detail than was required for the course if I asked the professor to do so. (during office hours)
10. Always prepared and helpful. Willing to go over a few homework problems with the class if we needed it.
11. Shows enthusiasm more than the subjects she teaches, has a sense of humor, provides notes that are easy to follow and look back upon for review, but you still have to write some on the notes so you are kept engaged.

Fair testing policy, fair homework load, provides extra work if you want to review.

12. She was a great teacher of the knowledge that she already had. She was always willing to answer the questions we had and to help us understand the questions we asked. My one drawback was the ridiculously large amounts of homework she gave to us.

13. All around great professor. The thing I liked most about Dr. Tabing is the fact that she was truly took the anonymous mid-quarter surveys into consideration and didn't have the attitude of, "Well I'm the teacher and the Doctor so I'll chose how I like to run my classroom and that's it". She really built off the comments that students made would be more helpful and implemented it in class, something that was pretty easily recognizable. This was something I liked most about Dr. Tabing. Overall, just good performance in the classroom and lectures and available outside of the classroom for help.

14. She was open to questions and gave answers if she thought we would be able to understand it. She was always willing to help on homework problems in-class and especially outside of class. She was also very easy to approach about it, and kept a more relaxed environment.

15. I would say that Dr. Tabing is the best teacher/professor I have ever had for any course. I have spent hours in her office when I didn't understand concepts. She was exceptionally helpful, and always there for help whenever I needed her. Her excitement for calculus definitely transfers to her teaching and her effectiveness. It is impossible to be bored in her classes. Dr. Tabing is a huge asset to the mathematics department here, especially considering that this is her first quarter here.

16. She was obviously very knowledgeable in the subject of calculus, along with enthusiastic to teach it to her students. At times, her explanations were somewhat confusing and/or rambling, but was still a solid professor for this course. She was almost always available to help, either through office hours or emails, which was great for a math course.

17. Dr. Tabing is very easy to relate to, easily accessible, and an excellent teacher.

18. Dr. Tabing is a great professor. She's genuinely interested in the subject she's teaching and really cares about helping us learn the material. I will say she started out the year a little scattered in solving problems, but I was quickly able to adapt to her personality and teaching style.

19. Dr. Tabing is excellent!

20. See first page