Spring 2013, MATH 245, Exam 3

Wednesday, April 24, 2013; 9–9:50am

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Name: _____

Circle the time of your discussion section: **2pm** **3pm** **4pm**

Instructions:

- No notes, books, calculators, etc.
- Answer all questions and clearly indicate your answers.
- **Show your work!** Points might be taken off for correct answer with no explanations. Wrong answer with no explanations is worth zero points.

Problem	Possible	Actual
1	10	
2	10	
3	10	
4	20	
Total	50	

Problem 1. Determine all values of the parameter c for which the critical point of the system

$$\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} c & 1 \\ 2 & c \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$

is a saddle.

Problem 2. Determine all values of the parameter c for which all solutions of the system

$$\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} -2 & c \\ 1 & -2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$

are asymptotically stable.

Problem 3. Sketch the phase portrait for the equation $y'' + 2y' + y = 0$.

Problem 4. For the system,

$$\begin{cases} x' = -y + xy \\ y' = 3x - x^2 - xy \end{cases}$$

determine the location and type of all critical points.