Spring 2017, MATH 407, Mid-Term Exam 1

Wednesday, February 22, 2017

Instructor S. Lototsky (KAP 248D; x0–2389; lototsky@math.usc.edu)

Name: ______________________________

Circle the time of your discussion section: **10am** **11am**

Instructions:

- No books, notes, or calculators.
- You have 50 minutes to complete the exam.
- **Show your work**.

Problem	Possible	Actual
1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

Problem 1. Consider two events A and B such that $P(A) = P(B) = 0.6$.
(a) Explain why the events cannot be mutually exclusive.

(b) Suppose that the events are independent. Compute $P(A \bigcup B^c)$. [B^c means the complement of B.]

Problem 2. Compute the proportion of all the four-children families with more girls than boys. Assume that boys and girls are equally likely. [In other words, you are dealing with $\mathcal{B}(4, 1/2)$.]

Problem 3. A population contains twice as many females as males. In this population, 5% of males and 0.25% of females are color-blind. A color-blind person is selected at random. Compute the probability that the person is male.

Problem 4. Consider the function

$$f(x) = \begin{cases} C(2 - e^{-x}) & x \geq 0 \\ 0 & x < 0. \end{cases}$$

(a) Could f be a cumulative distribution function? If yes, explain why and determine C; if not, explain why.

(b) Could f be a probability density function? If yes, explain why and determine C; if not, explain why.

Problem 5. Let U be exponential random variable with parameter 1. Compute the probability density function of e^U.