

## Exam 1 (Part I)

Friday, February 21, 2014

Name: \_\_\_\_\_

This is the in-class portion of Exam 1. This is a closed-book and closed-notes exam; you may consult only the “Special Distributions” handout.

Show all significant work and give reasons for all your answers. Use your own paper and/or the paper provided by the instructor. You have up to 50 minutes to work on the following 3 questions. Relax.

1. Let  $(\mathcal{C}, \mathcal{B}, \Pr)$  denote a probability space. Let  $A$  and  $B$  denote events in  $\mathcal{B}$  with  $\Pr(A) = 4/25$  and  $\Pr(B) = 3/25$ . Assume that the probability of the joint occurrence of  $A$  and  $B$  is  $1/25$ .
  - (a) Compute the probability that at least one of the events  $A$  or  $B$  will occur.
  - (b) Explain why  $A$  and  $B$  are not independent events.
  - (c) Compute the probability of occurrence of event  $A$ , given that event  $B$  has occurred.
  - (d) Compute the probability of occurrence of event  $A$ , given that event  $B$  has **not** occurred.
  - (e) Compute the probability that event  $A$  will not occur, given that event  $B$  has occurred.
  
2. A bowl contains 4 chips of the same size and shape. One and only one of these chips is red. In an experiment, chips are drawn at random from the bowl, one at a time and without replacement, until the red chip is drawn. Let  $X$  denote the number of draws needed to get the red chip.
  - (a) Compute the pmf,  $p_X$ , of  $X$  and sketch it.
  - (b) Compute the cumulative distribution function of  $X$  and sketch it.
  
3. Let  $X \sim \text{Exponential}(1)$  and define  $Y = \frac{1}{X}$ .
  - (a) Compute the cdf,  $F_Y$ , for  $Y$  in terms of the cdf for  $X$ .
  - (b) Compute the pdf of  $Y$ .