Raquel Prado
Department of Applied Mathematics and Statistics
Name: _____
AMS-131. Winter 2018

Midterm Exam, Type B

The midterm is closed-book, you are only allowed to use one page of notes and a calculator. Please attach your formula sheet.

There are 4 problems, 100 points total. The point values for each problem are listed below. Some problems have multiple parts. Please provide a detailed calculation (not just a number) or an explanation (or both, as needed) to support your idea of the right answer in each problem. If you run out of space in any of the questions please use the last page and indicate that you are doing so.

REMEMBER: THIS TEST IS TO BE ENTIRELY YOUR OWN EFFORTS. Cheating on this test will result in the severest disciplinary action possible under UCSC rules.

Problem	Possible Points	Your points
1	20	
2	25	
3	20	
4	35	
Total	100	

Applied Math and Statistics
Midterm Exam, Type B AMS-131.

1. (20 points) A certain electronic system contains 4 electronic components. Suppose that the probability that each individual component will fail is 0.1 and that the components fail independently of each other.

   (a) (10 points) What is the probability that at least one of the components has failed?

(b) (10 points) Given that at least one of the components has failed, what is the probability that at least two of the components have failed?

2. (25 points) Consider a student taking a multiple-choice test where each question has 4 possible answers. Let 1/5 be the probability that a student knows the correct answer of any given question and 4/5 the probability that the student is guessing the answer for such question. Assume that if a student guesses the answer to a question, they have a 1/4 probability of getting the correct answer to the question. What is the probability that the student knew the answer to a specific question given that the student answered such question correctly?

3. (20 points) Let X be a discrete random variable with p.f. defined as follows:

$$f(x) = \begin{cases} c|x-3| & \text{for} \quad x = -1, 0, 1, 2, \\ 0 & \text{otherwise,} \end{cases}$$

with c a constant.

(a) (8 points) Find c.

(b) (12 points) Find the cumulative distribution function (c.d.f.) of X denoted as $F(x)$. Sketch $F(x)$.

4. (35 points) Suppose that X and Y have a continuous joint distribution for which the joint p.d.f. is defined as follows:

$$f(x,y) = \begin{cases} cy^2 & \text{for } 0 \le x \le 3 \text{ and } 0 \le y \le 3, \\ 0 & \text{otherwise,} \end{cases}$$

where c is a constant.

(a) (10 points) Find c.

(b) (10 points) Find $Pr(X \ge Y)$.

(c) (9 points) Find the p.d.f. of Y, denoted as $f_Y(y)$.

(d) (6 points) Find $Pr(Y < 2)$.

EXTRA SPACE