

Name:

Math 29 – Probability

Practice Third Midterm Exam 1

Instructions:

1. Show all work. You may receive partial credit for partially completed problems.
2. You may use calculators and a one-sided sheet of reference notes. You may not use any other references or any texts.
3. You may not discuss the exam with anyone but me.
4. Suggestion: Read all questions before beginning and complete the ones you know best first. Point values per problem are displayed below if that helps you allocate your time among problems.
5. You need to demonstrate that you can solve all integrals in problems that do not have a (DO NOT SOLVE) statement. I.E. write out some work showing how you solved the integration, including if necessary integration by parts.
6. Good luck!

Problem	1	2	3	4	Total
Points Earned					
Possible Points					50

1. Let X and Y be two random variables such that their joint pdf is given by:

$$f_{X,Y}(x, y) = xe^{-x(y+1)}, x > 0, y > 0 \text{ and } 0, \text{ otherwise.}$$

a. Find the distribution (i.e. the pdf) of $Z=XY$.

1. continued

b. Set up (DO NOT SOLVE) a double integral to find $E(XY)$ using the joint pdf.

c. Find $E(XY)$ using Z in some fashion (Hint: DO NOT try to solve b., there is another way).

d. Find the conditional pdf of Y given X .

2. a. Find the expected value of X^3 given Y when the joint pdf of X and Y is given by

$$f_{X,Y}(x, y) = \frac{e^{-y}}{y}, 0 < x < y < \infty \text{ and } 0, \text{ otherwise.}$$

(For partial credit, you may state the conditional pdf of X given Y .)

b. Set up (DO NOT SOLVE) an integral to find the expected value of $X^2 + e^X + 12$ given Y .

3. Resistors in a circuit have an average resistance of 190 ohms and a standard deviation of 8 ohms. Suppose 40 resistors are randomly selected for use. Note that resistance is a continuous random variable.

a. What is the probability that the average resistance for the set of resistors is between 188 and 191 ohms?

b. What is the probability that the total resistance for the set of resistors does not exceed 7630 ohms?

4. Let X_1, X_2, \dots, X_5 be independent $\text{Geo}(.6)$ random variables. Prove (i.e. demonstrate with some work) that $Y = X_1 + X_2 + X_3 + X_4 + X_5$ is Negative Binomial ($r=5, p=.6$) with some justification for your steps.