Math 244-Final Exam   Name:_____

December 16, 2009   **Student #:** _____

<u>**Instructor: Dhar**</u>

Must show all work to receive full credit!!!

I pledge that I have not violated the NJIT code of honor_____

1. How many 5-digit numbers can be formed form the integers 1, 2, …, 9 if no digit can appear more than twice? (For instance, 41434 is not allowed.) (12 points) (Self-test problems and exercises #10, page 20)

2. A total of 30 percent of American males smoke cigarettes, 6 percent smoke cigars and 3 percent smoke both cigars and cigarettes. What percentage of males smokes neither cigars nor cigarettes? What percentage smokes cigars but not cigarettes? (12 points) (Homework problem 11, page 51)

3. Let X_1 be Gamma with ($\lambda = 7, \alpha = 4$) and X_2 be Gamma with ($\lambda = 7, \alpha = 5$). If X_1 and X_2 are independent derive the distribution of Y= $X_1 + X_2$. (12 points) (Done in class for general case, also on page 254-255)
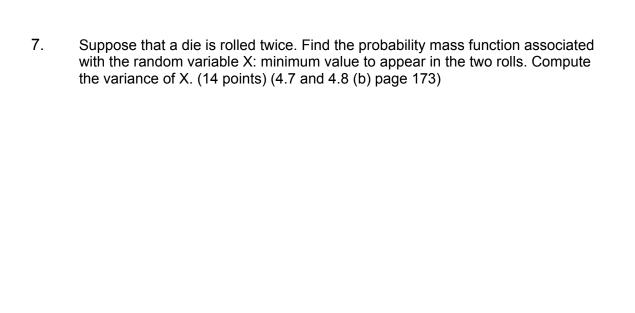
4. Let $f(x,y) = 24xy \ 0 \le x \le 1, 0 \le y \le 1, 0 \le x + y \le 1$ and let it equal zero otherwise.
    (a) Compute the marginal density of X.
    (b) Compute the probability P(X<2Y)
    (c) Is X independent of Y? Why or why not?   (18 points)

5. If X_1 and X_2 are independent exponential random variables, each having parameter λ find the joint density function of $Y_1 = X_1 + X_2$ and $Y_2 = e^{X_1}$. (12 points) (page 290, #6.58)

6. Let X and Y have joint density given by

$$f(x,y) = \begin{cases} 2e^{-2x}\Big/x, & 0 \le x < \infty, 0 \le y \le x, \\ 0, & elsewhere. \end{cases}$$

Compute E(XY), E(X) and E(Y) (10 points)   (7.4, page 373 and 7.38, page 375)

7.   Suppose that a die is rolled twice. Find the probability mass function associated with the random variable X: minimum value to appear in the two rolls. Compute the variance of X. (14 points) (4.7 and 4.8 (b) page 173)

8. A parallel system functions whenever at least one of its components works. Consider a parallel system of n components, and suppose that each component works independently with probability 1/3. Find the conditional probability that component 1 works given that the system is functioning. (10points)