

MATH 333: Probability & Statistics. **Exam 2** (Spring 2003)

April 9, 2003 (B) NJIT

Name:	SSN:	Section #
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→ **Must show all work to receive full credit.**

I pledge my honor that I have abided by the Honor System. _____
(Signature)

Scores	
#1	
#2	
#3	
#4	
#5	
Total	

1. Random variable X has probability density function $f(x) = (4x - x^2) / k$ if $0 \leq x \leq 4$,
 $f(x) = 0$ otherwise.

(a) What is the value of k ? (8 points)

(b) Determine $F(3)$, where $F(x)$ is the cumulative distribution function of X . (8 points)

(c) What is the expected value of X ? (7 points)

(d) What is the median of the distribution of X ? (7 points)

(EXAM CONTINUES ON THE NEXT PAGE)

2. Telephone calls arriving at a phone exchange are often modeled as a Poisson process. Assume that on the average there are eight calls per hour.
- (a) What is the probability that there are exactly four calls in one hour? (7 points)
- (b) What is the probability that there are two calls or fewer in forty-five minutes? (8 points)
- (c) What is the variance of time between the arrival of one call and the fifth call thereafter?
(*Hint:* What is the variance of the time between two consecutive calls?) (8 points)
3. It is known that the average annual salary of the employee at some department is \$50,000 with standard deviation \$10,000. A sample of fifty of the employee's salaries was selected at random. What is the (approximate) probability that
- (a) the average for this sample is less than \$45,000? (7 points)
- (b) the average for this sample is between \$46,000 and \$50,000? (8 points)

(EXAM CONTINUES ON THE NEXT PAGE)

4. The life of automobile voltage regulators has an exponential distribution with a mean life of five years. You purchase an automobile that is five years old, with working voltage regulator, and plan to own it for five years.
- (a) What is the probability that the voltage regulator fails during your ownership? (8 points)
- (b) If your regulator fails after you own the automobile two years and it is replaced, what is the expected time until the next failure? (8 points)
5. A shipment of 1000 microprocessor chips arrives in a factory. This factory will draw a random sample of twenty-five chips and accept the shipment only if there are no more than two defective chips in the sample.
- (a) If 3% of all chips are defective, what is the probability of *rejecting* the shipment? (8 points)
- (b) If 15% of all chips are defective, what are the expected value and variance of the number of defective chips in the sample? (8 points)

END OF EXAMINATION