Be sure to show all necessary steps to received full credit.

1. The number of monthly breakdowns of a computer is a random variable having a Poisson distribution with \( \lambda = 1.8 \). Find the probabilities that this computer will function

(a) without a breakdown.

(b) with only one breakdown.

2. In a given city 4 percent of all licensed drivers will be involved in at least one car accident in any given year. Use the Poisson approximation to the binomial distribution to determine the probability that among 150 licensed drivers randomly chosen in this city

(a) only five will be involved in at least one accident in any given year.

(b) at most three will be involved in at least one accident in any given year.

3. Let \( X \) be a random variable with uniform distribution over the interval \([\alpha, \beta]\). Determine the \( r \)-th moment about the mean of \( X \).

4. A point \( D \) is chosen on the line \( AB \), whose midpoint is \( C \) and whose length is \( a \). If \( X \), the distance from \( D \) to \( A \), is a random variable having the uniform density with \( \alpha = 0 \) and \( \beta = a \), what is the probability that \( AD, BD \) and \( AC \) will form a triangle?

5. Determine the value of \( x \) for which the probability density function of the gamma random variable attains a local maximum.

6. If a company employs \( n \) salespersons, its gross sales in thousands of dollars may be regarded as a random variable having a gamma distribution with \( \alpha = 80\sqrt{n} \) and \( \beta = 2 \). If the sales cost is $8000 per salesperson, how many salespersons should the company employ to maximize the expected profit?