Homework # 2 (Montgomery & Runger, 5ed)

Answers to odd-numbered problems can be found in Appendix B. Answers to even-numbered problems are provided below.

Chapter 3 Discrete Random Variables and Probability Distributions

Poisson Distributions

Pages 101 - 103, Section 3-9, Problems 3-129, 132, 137, 139, 140

3-132. Let X denote the number of calls in one hour. Then, X is a Poisson random variable with \( \lambda = 10 \).

\[ a) \quad P(X = 5) = e^{-10} \frac{10^5}{5!} = 0.0378 \]

\[ b) \quad P(X \leq 3) = e^{-10} + \frac{e^{-10} 10}{1!} + \frac{e^{-10} 10^2}{2!} + \frac{e^{-10} 10^3}{3!} = 0.0103 \]

\[ c) \quad \text{Let } Y \text{ denote the number of calls in two hours. Then, } Y \text{ is a Poisson random variable with } \lambda = 20. \]

\[ P(Y = 15) = \frac{e^{-20} 20^{15}}{15!} = 0.0516 \]

\[ d) \quad \text{Let } W \text{ denote the number of calls in 30 minutes. Then } W \text{ is a Poisson random variable with } \lambda = 5. \]

\[ P(W = 5) = \frac{e^{-5} 5^5}{5!} = 0.1755 \]

3-140. a) Let X denote the failures in 8 hours. Then, X has a Poisson distribution with \( \lambda = 0.16 \).

b) Let Y denote the number of failure in 24 hours. Then, Y has a Poisson distribution with \( \lambda = 0.48 \).

Chapter 4 Continuous Random Variables and Probability Distributions

Exponential Distribution

Pages 136 - 137, Section 4-8, Problems 4-93, 95, 97, 99, 103, 105