

- 4.4 The distribution of the lifetime (in hours) of a battery for a laptop computer is modeled as an exponential random variable with parameter $\theta = 1/3.5$. Compute the safe life of the battery, which is defined to be the 10th percentile of the distribution.

- 4.9 The tensile strength S (measured in grams per square centimeter) of a fiber thread has a pdf given by

$$f(x) = kx^2(2 - x), \quad 0 < x < 2$$

$$f(x) = 0 \quad \text{elsewhere}$$

- (a) Find the value of k .
 (b) Compute $P(0.5 < S < 1.5)$.
 (c) Compute $P(S > 1)$.

- 4.11 Suppose the number of days to failure of a diesel locomotive has an exponential distribution with parameter $1/\theta = 43.3$ days. Compute the probability that the locomotive operates one entire day without failure.

- 4.14 Compute $E(X)$, $E(X^2)$, and $V(X)$ for the random variable X with pdf given by:

(a) $f(x) = \frac{1}{2} - \frac{x}{4}, -1 \leq x \leq 1; f(x) = 0$ elsewhere.

(b) $f(x) = (1/2) \sin x, 0 \leq x \leq \pi; f(x) = 0$ elsewhere.

(c) $f(x) = 3(1 - x)^2, 0 < x < 1; f(x) = 0$ elsewhere.

(d) $f(x) = x, 0 \leq x \leq 1; f(x) = 2 - x, 1 \leq x \leq 2; f(x) = 0$ elsewhere.

(e) $f(x) = (1 + x), -1 \leq x \leq 0; f(x) = (1 - x), 0 \leq x \leq 1; f(x) = 0$ elsewhere.

(f) $f(x) = (1/2)e^{-|x|}, -\infty < x < \infty$.

- 4.21 Suppose the lifetime T of an electronic component is exponentially distributed with $\theta^{-1} = 1000$, and the warranty period is 700 hours. The manufacturing cost and selling price of each component are \$6 and \$10, respectively. If the item fails before K hours, the manufacturer replaces the faulty component without charge.

- (a) Compute the expected profit per customer if the warranty period is (i) 700 hours, (ii) 900 hours.

- (b) How long can the warranty period be extended before the expected profit turns into a loss?

(Hint: Review Example 4.6.)