

Chapter 5

4. The probability density function of X , the lifetime of a certain type of electronic device (measured in hours), is given by

$$f(x) = \begin{cases} \frac{10}{x^2} & x > 10 \\ 0 & x \leq 10 \end{cases}$$

- (a) Find $P\{X > 20\}$.
- (b) What is the cumulative distribution function of X ?
- (c) What is the probability that of 6 such types of devices at least 3 will function for at least 15 hours? What assumptions are you making?

8. The lifetime in hours of an electronic tube is a random variable having a probability density function given by

$$f(x) = xe^{-x} \quad x \geq 0$$

Compute the expected lifetime of such a tube.

13. You arrive at a bus stop at 10 o'clock, knowing that the bus will arrive at some time uniformly distributed between 10 and 10:30.
- (a) What is the probability that you will have to wait longer than 10 minutes?
 - (b) If at 10:15 the bus has not yet arrived, what is the probability that you will have to wait at least an additional 10 minutes?
21. Suppose that the height, in inches, of a 25-year-old man is a normal random variable with parameters $\mu = 71$ and $\sigma^2 = 6.25$. What percentage of 25-year-old men are over 6 feet 2 inches tall? What percentage of men in the 6-footer club are over 6 foot 5 inches?
32. The time (in hours) required to repair a machine is an exponentially distributed random variable with parameter $\lambda = \frac{1}{2}$. What is
- (a) the probability that a repair time exceeds 2 hours;
 - (b) the conditional probability that a repair takes at least 10 hours, given that its duration exceeds 9 hours?
37. If X is uniformly distributed over $(-1, 1)$, find
- (a) $P\{|X| > \frac{1}{2}\}$;
 - (b) the density function of the random variable $|X|$.

Theoretical exercise: Chapter 5

14. If X is an exponential random variable with parameter λ , and $c > 0$, show that cX is exponential with parameter λ/c .