

5.6: Chapter Review

5.2: Properties of Continuous Probability Density Functions

The probability density function (pdf) is used to describe probabilities for continuous random variables. The area under the density curve between two points corresponds to the probability that the variable falls between those two values. In other words, the area under the density curve between points a and b is equal to $P(a < x < b)$. The cumulative distribution function (cdf) gives the probability as an area. If X is a continuous random variable, the probability density function (pdf), $f(x)$, is used to draw the graph of the probability distribution. The total area under the graph of $f(x)$ is one. The area under the graph of $f(x)$ and between values a and b gives the probability $P(a < x < b)$.

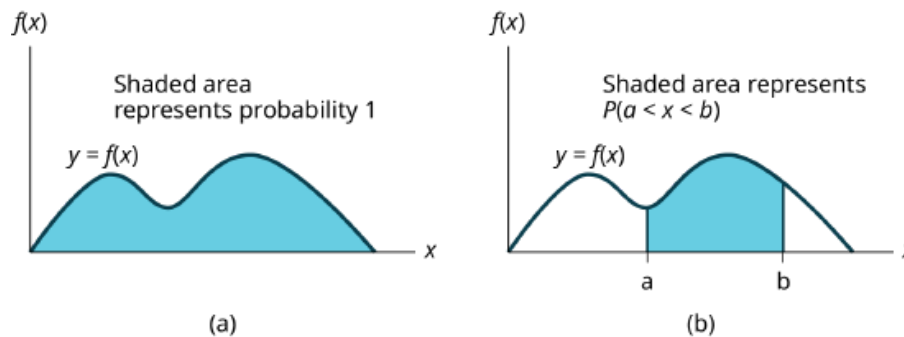


Figure 5.6.1

The cumulative distribution function (cdf) of X is defined by $P(X \leq x)$. It is a function of x that gives the probability that the random variable is less than or equal to x .

5.3: The Uniform Distribution

If X has a uniform distribution where $a < x < b$ or $a \leq x \leq b$, then X takes on values between a and b (may include a and b). All values x are equally likely. We write $X \sim U(a, b)$. The mean of X is $\mu = \frac{a+b}{2}$. The standard deviation of X is $\sigma = \sqrt{\frac{(b-a)^2}{12}}$. The probability density function of X is $f(x) = \frac{1}{b-a}$ for $a \leq x \leq b$. The cumulative distribution function of X is $P(X \leq x) = \frac{x-a}{b-a}$. X is continuous.

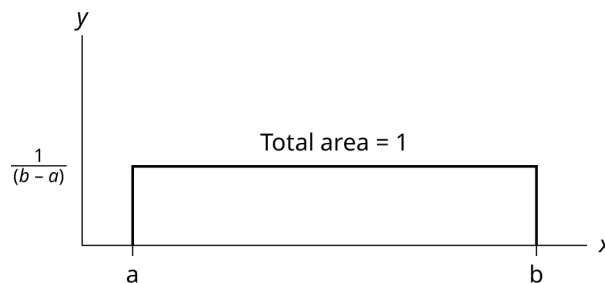


Figure 5.6.2

The probability $P(c < X < d)$ may be found by computing the area under $f(x)$, between c and d . Since the corresponding area is a rectangle, the area may be found simply by multiplying the width and the height.

5.4: The Exponential Distribution

If X has an exponential distribution with mean μ , then the decay parameter is $m = \frac{1}{\mu}$. The probability density function of X is $f(x) = me^{-mx}$ (or equivalently $f(x) = \frac{1}{\mu}e^{-x/\mu}$). The cumulative distribution function of X is $P(X \leq x) = 1 - e^{-mx}$.

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