5.6: Formula Review

5.2 Properties of Continuous Probability Density Functions

Probability density function (pdf) $f(x)$:

- $f(x) \geq 0$
- The total area under the curve $f(x)$ is one.

Cumulative distribution function (cdf): $P(X \leq x\ )$

5.3 The Uniform Distribution

$X =$ a real number between a and b (in some instances, X can take on the values a and b). $a =$ smallest X; $b =$ largest X

$$X \sim U(\mathrm{a}, \mathrm{b}) \tag{5.6.1}$$

The mean is $\mu = \frac{a+b}{2}$

The standard deviation is $\sigma = \sqrt{\frac{(b-a)^2}{12}}$

Probability density function: $f(x) = \frac{1}{b-a}$ for $a \leq X \leq b$

Area to the Left of x : $P(X < x) = (x-a)\left(\frac{1}{b-a}\right)$

Area to the Right of x : $P(X > x) = (b-x)\left(\frac{1}{b-a}\right)$

Area Between c and d : $P(c < x < d) = (\ \text{base})(\text{height}) = (d-c)\left(\frac{1}{b-a}\right)$

- pdf: $f(x) = \frac{1}{b-a}$ for $a \leq x \leq b$
- cdf: $P(X \leq x) = \frac{x-a}{b-a}$
- mean $\mu = \frac{a+b}{2}$
- standard deviation $\sigma = \sqrt{\frac{(b-a)^2}{12}}$
- $P(c < X < d) = (d-c)\left(\frac{1}{b-a}\right)$

5.4 The Exponential Distribution

- pdf: $f(x) = me^{(-mx)}$ where $x \geq 0$ and $m > 0$
- cdf: $P(X \leq x) = 1 - e^{(-mx)}$
- mean $\mu = \frac{1}{m}$
- standard deviation $\sigma = \mu$
- Additionally
  - $P(X > x) = e^{(-mx)}$
  - $P(a < X < b) = e^{(-ma)} - e^{(-mb)}$
- Poisson probability: $P(X = x) = \frac{\mu^x e^{-\mu}}{x!}$ with mean and variance of μ