CHAPTER 3: IMPORTANT PROBABILITY DISTRIBUTIONS

DISCRETE PROBABILITY DISTRIBUTIONS	CONTINUOUS PROBABILITY DISTRIBUTIONS
Discrete Uniform Distribution	Continuous Uniform Distribution
Bernoulli Distribution	Exponential Distribution
Binomial Distribution	Normal Distribution (Gaussian Distribution)
Poisson Distribution	Standard Normal Distribution
Geometric Distribution	Chi-Squared Distribution
(Pascal) Negative Binomial Distribution	Student's t-Distribution
For these discrete random variables, • PMF • Expectation • Variance • Mode value for Binomial Distribution r.v	For these continuous random variables, • PDF • CDF • Expectation • Variance • Memoryless property of Exponential Distribution
Approximation of Binomial Distribution by a Poisson Distribution Normal Approximation to the Binomial Distribution	

Problem 3.11. Let X be a binomial $\mathcal{B}(n,p)$ random variable with parameters $n = 28$ and $p = 0.25$. Find

(1) $\mathbb{P}(X > 2)$.

(2) $\mathbb{E}[X^2]$.

Problem 3.12. Let X be a Poisson $\mathcal{P}(\lambda)$ random variable with $\lambda = 5$. Find

(1) $\mathbb{E}[X^2]$.

(2) $\mathbb{E}[X^2 - 7X + 10]$.

(3) $\mathbb{E}[9X - 5]$.

Problem 3.13. Let X be an exponential $\mathrm{Exp}(\lambda)$ random variable with $\lambda = 0.1$. Find

(1) $\mathbb{E}[X], \mathbb{E}[X^2], \mathrm{Var}(X)$.

(2) $\mathbb{P}(X > 11 | X > 6)$.

(3) $\mathbb{P}(X > 11 | X > 8)$.

Problem 3.14. Let X be a uniform $\mathcal{U}[0, 30]$ random variable. Find

(1) $\mathbb{E}[X], \mathbb{E}[X^2], \mathrm{Var}(X)$.

(2) $\mathbb{P}(X > 25 | X > 15)$.

Problem 3.15. The lifetime of an electronic component has an exponential distribution with a mean lifetime of 8 years.

(1)   Find the probability that a randomly selected one such electronic component has a lifetime of more than 6 years.

(2)   Given that a certain electronic component has already lasted more than 5 years, find the probability that it will last more than 10 years.