Function Sheet 2

Definition 3.9- Negative Binomial Probability Distribution

$$p(y) = \binom{y-1}{r-1} p^r q^{y-r}$$

Theorem 3.9- Mean and Standard Deviation for Negative Binomial Distribution

$\mu = E(Y) = \frac{r}{p}$ and $\sigma^2 = V(Y) = \frac{r(1-p)}{p^2}$

Definition 3.10- Hypergeometric Probability Distribution

$$p(y) = \frac{\binom{r}{y}\binom{N-r}{r-y}}{\binom{N}{n}}$$

Theorem 3.10- Mean and Standard Deviation for Hypergeometric Distribution

$\mu = E(Y) = \frac{nr}{N}$ and $\sigma^2 = V(Y) = n\left(\frac{r}{N}\right)\left(\frac{N-r}{N}\right)\left(\frac{N-n}{N-1}\right)$

Definition 3.11- Poisson Probability Distribution

$$p(y) = \frac{\lambda^y}{y!}e^{\lambda}, \qquad y = 0, 1, 2, \ldots, \lambda > 0$$

Theorem 3.14- Tchebysheff's Theorem

$P(|Y-\mu| < k\sigma) \geq 1 - \frac{1}{k^2}$ or $P(|Y-\mu| \geq k\sigma) \leq \frac{1}{k^2}$

Definition 4.1- Cumulative Distribution Function

$Let\ Y\ denote\ any\ random\ variable. The\ distribution\ function\ of\ Y\ , denoted\ by$

$F(y), is\ such\ that\ F(y) = P(Y \leq y)\ for\ -\infty < y < \infty.$

Definition 4.3- Probability Density Function

$$f(y) = \frac{dF(y)}{dy} = F'(y)$$

Definition 4.6- Uniform Probability Distribution

$$f(y) = \begin{cases} \dfrac{1}{\Theta_2 - \Theta_1}, & \Theta_1 \le y \le \Theta_2 \\ 0, & elsewhere \end{cases}$$

Definition 4.9- Gamma Probability Distribution

$$f(y) = \begin{cases} \dfrac{y^{\alpha-1}e^{-y/\beta}}{\beta^{\alpha}\Gamma(\alpha)}, & 0 \le y < \infty \\ 0, & elsewhere \end{cases}$$

$where$

$$\Gamma(\alpha) = \int_0^{\infty} y^{\alpha-1}e^{-y}dy$$

Definition 4.10- Chi-Square Distribution

Let v be a positive integer. A random variable Y is said to have a chi-square distribution with v degrees of freedom if and only if Y is a gamma-distributed random variable with parameters

$\alpha = v/2 \quad and \quad \beta = 2$

Theorem 4.9- Mean and Standard Deviation for Chi-Square Distribution

$\mu = E(Y) = v \quad and \quad \sigma^2 = V(Y) = 2v$

Definition 4.11- Exponential Distribution

$$f(y) = \begin{cases} \dfrac{1}{\beta}e^{-y/\beta}, & 0 \le y < \infty \\ 0, & elsewhere \end{cases}$$

Theorem 4.10- Mean and Standard Deviation for Exponential Distribution

$\mu = E(Y) = \beta \quad and \quad \sigma\, 2 = V(Y) = \beta^2$