Commonly Tested Continuous Distributions

In each case, we will give the support, pdf, cdf, mean, variance, and mgf.

1. $X \sim U(a,b)$ (Uniform Distribution on the interval (a,b).)

$$Supp(X) = (a,b)$$
$$f_X(x) = \frac{1}{b-a}$$
$$F_X(x) = \frac{x-a}{b-a}$$
$$E[X] = \frac{a+b}{2}$$
$$Var(X) = \frac{(b-a)^2}{12}$$
$$M_X(t) = \frac{e^{b\cdot t} - e^{a\cdot t}}{t\cdot(b-a)}$$

2. $X \sim EX(mean = 1/\lambda)$ (Exponential Distribution with mean $\frac{1}{\lambda}$.)

$$Supp(X) = (0,\infty)$$
$$f_X(x) = \lambda \cdot e^{-\lambda\cdot x}$$
$$F_X(x) = 1 - e^{-\lambda\cdot x}$$
$$E[X] = \frac{1}{\lambda}$$
$$Var(X) = \frac{1}{\lambda^2}$$
$$M_X(t) = \frac{\lambda}{\lambda - t}$$

3. $X \sim N(\mu, \sigma^2)$ (Normal Distribution with mean μ and variance σ^2.)

$$Supp(X) = (-\infty, \infty)$$
$$f_X(x) = \frac{1}{\sigma \cdot \sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\cdot\sigma^2}}$$
$$E[X] = \mu$$
$$Var(X) = \sigma^2$$
$$M_X(t) = e^{\mu \cdot t + \frac{\sigma^2 t^2}{2}}$$

This distribution is actually the Non-Standard Normal Distribution. Notice that we didn't give a formula for the cdf. This is because there will be tables provided that give values for the cdf of the Standard Normal Distribution, denoted by *Z*. If we're given a Non-Standard Normal Distribution *X*, then we standardize it using the formula

$$Z = \frac{X - \mu}{\sigma}$$

Then use the given tables to find cdf values. This is illustrated in the examples.

We use the Standard Normal Distribution any time we are asked to approximate a probability associated with another random variable. We sometimes use an integer correction in these approximation problems. This is illustrated in the examples.

Within the context of pdf's, you may see a Gamma Function. For purposes of this exam, you should know that for positive integer values *n*, $\Gamma(n) = (n-1)!$. You should also know how to work with maximums and minimums of a sequence of independent random variables. We illustrate the techniques by examples.