←Discrete Distributions

Bernoulli
$0 < p < 1$

$f(x) = p^x(1-p)^{1-x}, \quad x = 0, 1$

$M(t) = 1 - p + pe^t$

$\mu = p, \quad \sigma^2 = p(1-p)$

Binomial
$b(n, p)$
$0 < p < 1$

$f(x) = \dfrac{n!}{x!(n-x)!}p^x(1-p)^{n-x}, \quad x = 0, 1, 2, \ldots, n$

$M(t) = (1 - p + pe^t)^n = (q + pe^t)^n$

$\mu = np, \quad \sigma^2 = np(1-p)$

Geometric
$0 < p < 1$

$f(x) = (1-p)^{x-1}p, \quad x = 1, 2, 3, \ldots$

$M(t) = \dfrac{pe^t}{1-(1-p)e^t}, \quad t < -\ln(1-p)$

$\mu = \dfrac{1}{p}, \quad \sigma^2 = \dfrac{1-p}{p^2}$

Negative Binomial
$0 < p < 1$
$r = 1, 2, 3, \ldots$

$f(x) = \dbinom{x-1}{r-1}p^r(1-p)^{x-r}, \quad x = r, r+1, r+2, \ldots$

$M(t) = \dfrac{(pe^t)^r}{[1-(1-p)e^t]^r}, \quad t < -\ln(1-p)$

$\mu = r\left(\dfrac{1}{p}\right), \quad \sigma^2 = \dfrac{r(1-p)}{p^2}$

Poisson
$0 < \lambda$

$f(x) = \dfrac{\lambda^x e^{-\lambda}}{x!}, \quad x = 0, 1, 2, \ldots$

$M(t) = e^{\lambda(e^t-1)}$

$\mu = \lambda, \quad \sigma^2 = \lambda$

Uniform
$m > 0$

$f(x) = \dfrac{1}{m}, \quad x = 1, 2, \ldots, m$

$\mu = \dfrac{m+1}{2}, \quad \sigma^2 = \dfrac{m^2-1}{12}$

←Continuous Distributions

Note: $\theta = \frac{1}{\lambda}$

Note: $q = 1 - p$

Note: $\Gamma(\alpha) = \int_0^\infty x^{\alpha-1}e^{-x}dx$

Remember:
Chi-Square Distribution *is a Gamma Distribution* with parameters Θ = 2 and α=r/2; r is the Chi-Square Distribution's degrees of freedom.

Also Note:
For integer values of n,

Γ(n) = (n-1)!

Exponential
$0 < \theta$

$f(x) = \dfrac{1}{\theta}e^{-x/\theta}, \quad 0 \le x < \infty$

$M(t) = \dfrac{1}{1-\theta t}, \quad t < \dfrac{1}{\theta}$

$\mu = \theta, \quad \sigma^2 = \theta^2$

Gamma
$0 < \alpha$
$0 < \theta$

$f(x) = \dfrac{1}{\Gamma(\alpha)\theta^\alpha}x^{\alpha-1}e^{-x/\theta}, \quad 0 \le x < \infty$

$M(t) = \dfrac{1}{(1-\theta t)^\alpha}, \quad t < \dfrac{1}{\theta}$

$\mu = \alpha\theta, \quad \sigma^2 = \alpha\theta^2$

Normal
$N(\mu, \sigma^2)$
$-\infty < \mu < \infty$
$0 < \sigma$

$f(x) = \dfrac{1}{\sigma\sqrt{2\pi}}e^{-(x-\mu)^2/2\sigma^2}, \quad -\infty < x < \infty$

$M(t) = e^{\mu t + \sigma^2 t^2/2}$

$E(X) = \mu, \quad \mathrm{Var}(X) = \sigma^2$

Uniform
$U(a, b)$
$-\infty < a < b < \infty$

$f(x) = \dfrac{1}{b-a}, \quad a \le x \le b$

$M(t) = \dfrac{e^{tb} - e^{ta}}{t(b-a)}, \quad t \ne 0; \quad M(0) = 1$

$\mu = \dfrac{a+b}{2}, \quad \sigma^2 = \dfrac{(b-a)^2}{12}$