List of Common Continuous Distributions

beta
$\alpha > 0$
$\beta > 0$

$$f(x) = \frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)}x^{\alpha-1}(1-x)^{\beta-1}, \quad 0 < x < 1$$

$$\mu = \frac{\alpha}{\alpha+\beta}, \quad \sigma^2 = \frac{\alpha\beta}{(\alpha+\beta+1)(\alpha+\beta)^2}$$

$$m(t) = 1 + \sum_{i=1}^{\infty}\left(\prod_{j=0}^{k-1}\frac{\alpha+j}{\alpha+\beta+j}\right)\frac{t^i}{i!}, \quad -\infty < t < \infty$$

Cauchy

$$f(x) = \frac{1}{\pi}\frac{1}{x^2+1}, \quad -\infty < x < \infty$$

Neither the mean nor the variance exists.
The mgf does not exist.

Chi-squared, $\chi^2(r)$
$r > 0$

$$f(x) = \frac{1}{\Gamma(r/2)2^{r/2}}x^{(r/2)-1}e^{-x/2}, \quad x > 0$$

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

$$m(t) = (1-2t)^{-r/2}, \quad t < \frac{1}{2}$$

$$\chi^2(r) \Leftrightarrow \Gamma(r/2, 2)$$

r is called the degrees of freedom.

Exponential
$\lambda > 0$

$$f(x) = \lambda e^{-\lambda x}, \quad x > 0$$

$$\mu = \frac{1}{\lambda}, \quad \sigma^2 = \frac{1}{\lambda^2}$$

$$m(t) = [1 - (t/\lambda)]^{-1}, \quad t < \lambda$$

Exponential(λ) $\Leftrightarrow \Gamma(1, 1/\lambda)$

F, $F(r_1, r_2)$
$r_1 > 0$
$r_2 > 0 > 0$

$$f(x) = \frac{\Gamma[(r_1+r_2)/2](r_1/r_2)^{r_1/2}}{\Gamma(r_1/2)\Gamma(r_2/2)}\frac{(x)^{r_1/2-1}}{(1+r_1x/r_2)^{(r_1+r_2)/2}}, \quad x > 0$$

If $r_2 > 2$, $\mu = \frac{r_2}{r_2-2}$. If $r > 4$, $\sigma^2 = 2\left(\frac{r_2}{r_2-2}\right)^2\frac{r_1+r_2-2}{r_1(r_2-4)}$.
The mgf does not exist.
r_1 is called the numerator degrees of freedom.
r_2 is called the denominator degrees of freedom.

Gamma, $\Gamma(\alpha, \beta)$
$\alpha > 0$
$\beta > 0$

$$f(x) = \frac{1}{\Gamma(\alpha)\beta^\alpha}x^{\alpha-1}e^{-x/\beta}, \quad x > 0$$

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

$$m(t) = (1-\beta t)^{-\alpha}, \quad t < \frac{1}{\beta}$$

Continuous Distributions, Continued	
Laplace $-\infty < \theta < \infty$	(2.2.1) $f(x) = \frac{1}{2}\, e^{-\lvert x-\theta \rvert}, \quad -\infty < x < \infty$ $\mu = \theta, \quad \sigma^2 = 2$ $m(t) = e^{t\theta}\frac{1}{1-t^2}, \quad -1 < t < 1$
Logistic $-\infty < \theta < \infty$	(6.1.8) $f(x) = \frac{\exp\{-(x-\theta)\}}{(1+\exp\{-(x-\theta)\})^2}, \quad -\infty < x < \infty$ $\mu = \theta, \quad \sigma^2 = \frac{\pi^2}{3}$ $m(t) = e^{t\theta}\Gamma(1-t)\Gamma(1+t), \quad -1 < t < 1$
Normal, $N(\mu, \sigma^2)$ $-\infty < \mu < \infty$ $\sigma > 0$	(3.4.6) $f(x) = \frac{1}{\sqrt{2\pi}\sigma} \exp\left\{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2\right\}, \quad -\infty < x < \infty$ $\mu = \mu, \quad \sigma^2 = \sigma^2$ $m(t) = \exp\{\mu t + (1/2)\sigma^2 t^2\}, \quad -\infty < t < \infty$
t, $t(r)$ $r > 0$	(3.6.1) $f(x) = \frac{\Gamma[(r+1)/2]}{\sqrt{\pi r}\,\Gamma(r/2)} \frac{1}{(1+x^2/r)^{(r+1)/2}}, \quad -\infty < x < \infty$ If $r > 1$, $\mu = 0$. If $r > 2$, $\sigma^2 = \frac{r}{r-2}$. The mgf does not exist. The parameter r is called the degrees of freedom.
Uniform $-\infty < a < b < \infty$	(1.7.4) $f(x) = \frac{1}{b-a}, \quad a < x < b$ $\mu = \frac{a+b}{2}, \quad \sigma^2 = \frac{(b-a)^2}{12}$ $m(t) = \frac{e^{bt}-e^{at}}{(b-a)t}, \quad -\infty < t < \infty$