TABLE OF CONTINUOUS DISTRIBUTIONS

Distribution	Density function $f_X(x)$	$M_X(t)$ mgf	Mean & Variance
Uniform	$\begin{cases} \dfrac{1}{b-a} & a \le x \le b \\ 0 & \text{elsewhere} \end{cases}$	$\dfrac{\left(e^{tb}-e^{ta}\right)}{(b-a)\,t}$	$\mu_X = \frac{(a+b)}{2}$ $\sigma_X^2 = \frac{(b-a)^2}{12}$
Gamma $g(\alpha;\ \lambda)$	$\begin{cases} \dfrac{\lambda^\alpha}{\Gamma(\alpha)} x^{\alpha-1} e^{-\lambda x}, & x \ge 0 \\ 0 & \text{elsewhere} \end{cases}$	$\left(1-\dfrac{t}{\lambda}\right)^{-\alpha}$, $t < \lambda$	$\mu_X = \dfrac{\alpha}{\lambda}$ $\sigma_X^2 = \dfrac{\alpha}{\lambda^2}$
Exponential (special gamma with $\alpha = 1$)	$\begin{cases} \lambda e^{-\lambda x}, & x \ge 0 \\ 0 & \text{elsewhere} \end{cases}$	$\left(1-\dfrac{t}{\lambda}\right)^{-1}$	$\mu_X = \dfrac{1}{\lambda}$ $\sigma_X^2 = \dfrac{1}{\lambda^2}$
Chi-squared $\chi^2(r)$ (special gamma with $\alpha = \dfrac{n}{2};\ \ \lambda = \dfrac{1}{2}$)	$\begin{cases} \dfrac{1}{\Gamma\left(\frac{n}{2}\right) 2^{\frac{n}{2}}} x^{\frac{n}{2}-1} e^{-\frac{x}{2}}, & x \ge 0 \\ 0 & \text{elsewhere} \end{cases}$	$(1-2t)^{-\frac{n}{2}}$	$\mu_X = n$ $\sigma_X^2 = 2n$
Normal $N\left(\mu;\ \sigma^2\right)$	$\dfrac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}, \quad -\infty < x < \infty$	$e^{\mu t + \frac{1}{2}\sigma^2 t^2}$	$\mu_X = \mu$ $\sigma_X^2 = \sigma^2$
Standard normal $N(0;\ 1)$	$\dfrac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2}, \quad -\infty < x < \infty$	$e^{\frac{1}{2}t^2}$	$\mu_X = 0$ $\sigma_X^2 = 1$
Beta type 1	$\begin{cases} \dfrac{\Gamma(a+b)}{\Gamma(a)\Gamma(b)} x^{a-1}(1-x)^{b-1}, & 0 \le x \le 1 \\ 0 & \text{elsewhere} \end{cases}$	Beyond the scope of this module	$\mu_X = \frac{a}{a+b}$ $\sigma_X^2 = \frac{ab}{(a+b)^2(a+b+1)}$

Description	Density function $[f_X(x)]$
t-distribution t_n	$\dfrac{\Gamma[(n+1)/2]}{\Gamma(n/2)\sqrt{n\pi}} \left(1+\dfrac{t^2}{n}\right)^{-\frac{1}{2}(n+1)}, \quad -\infty < t < \infty$
F-distribution $F_{m,n}$	$\dfrac{\Gamma[(m+n)/2]}{\Gamma(^m/_2)\Gamma(^n/_2)} \left(\dfrac{m}{n}\right)^{^m/_2} x^{^m/_2-1} \left(1+\dfrac{m}{n}x\right)^{-(m+n)/2} \quad x \ge 0$
k-th order statistic	$\dfrac{n!}{(k-1)!(n-k)!} [F_X(x)]^{k-1} [1-F_X(x)]^{n-k} f_X(x), \quad -\infty < x < \infty$

Commonly used series expansions
$e^{tx} = 1 + \dfrac{tx}{1!} + \dfrac{(tx)^2}{2!} + \dfrac{(tx)^3}{3!} + \ldots\ldots..$
$log(1+x) = log_e(1+x) = x - \dfrac{x^2}{2} + \dfrac{x^3}{3} - \dfrac{x^4}{4} + \ldots\ldots\ldots.$
$log(1-x) = log_e(1-x) = -x - \dfrac{x^2}{2} - \dfrac{x^3}{3} - \ldots\ldots\ldots.$