

Exponential and Gamma Distributions

		Exponential Distribution		Gamma Distribution
pdf	$X \sim \text{Exponential}(\beta)$	$f(x) = \frac{1}{\beta} e^{-\frac{x}{\beta}}, x > 0$	$X \sim \text{Gamma}(\alpha, \beta)$	$f(x) = \frac{1}{\Gamma(\alpha)\beta^\alpha} x^{\alpha-1} e^{-\frac{x}{\beta}}, x > 0$
Mean		β		$\alpha\beta$
Variance		β^2		$\alpha\beta^2$
mgf		$(1 - \beta t)^{-1}, t < \frac{1}{\beta}$		$(1 - \beta t)^{-\alpha}, t < \frac{1}{\beta}$
Related Distributions		$\sum_{i=1}^n X_i \sim \text{Gamma}(n, \beta)$		$2\frac{X}{\beta} \sim \text{Gamma}(\alpha, 2)$ Or $2\frac{X}{\beta} \sim \chi_{2\alpha}^2$
pdf	$X \sim \text{Exponential}\left(\frac{1}{\beta}\right)$	$f(x) = \beta e^{-\beta x}, x > 0$	$X \sim \text{Gamma}\left(\alpha, \frac{1}{\beta}\right)$	$f(x) = \frac{\beta^\alpha}{\Gamma(\alpha)} x^{\alpha-1} e^{-\beta x}, x > 0$
Mean		$\frac{1}{\beta}$		$\frac{\alpha}{\beta}$
Variance		$\frac{1}{\beta^2}$		$\frac{\alpha}{\beta^2}$
mgf		$\left(1 - \frac{t}{\beta}\right)^{-1}, t < \beta$		$\left(1 - \frac{t}{\beta}\right)^{-\alpha}, t < \beta$
Related Distributions		$\sum_{i=1}^n X_i \sim \text{Gamma}\left(n, \frac{1}{\beta}\right)$		$2\beta X \sim \text{Gamma}(\alpha, 2)$ Or $2\beta X \sim \chi_{2\alpha}^2$