Definition 1 (Gamma-function) $\Gamma(n)$ *is an extension of the factorial function to complex and real arguments. This relation is given by* $\Gamma(n) = (n-1)!$ *for all* $n \in \mathrm{N}$.

Definition 2 (Integral form) *For* $z \in \mathrm{R}$, $z > 0$, *the* Γ*-function is given by:*

$$\Gamma(z) = \int_0^\infty t^{z-1} e^{-t} dt$$

Definition 3 (Probability density function (pdf)) *A function* $f(x)$ *is a pdf if and only if:*

$$P(a \leq X \leq b) = \int_a^b f(x)dx, f(x) \geq 0, \forall x \in \mathrm{R}$$

Result 1 $f(x)$ *is a probability density function if and only if the following are true:*

$$f : \mathrm{R} \rightarrow [0, 1], f(x) \geq 0 \quad (1)$$

$$\int_{-\infty}^\infty f(x)dx = 1 \quad (2)$$

Notation 1 Z *denotes the standard normal distribution (a normal distribution with mean* 0 *and standard deviation* 1*). The pdf of this distribution is given by:*

$$f_Z(x) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2}$$

Definition 4 ($\Gamma(\alpha, \beta)$-distribution) *The* $\Gamma(\alpha, \beta)$*-family is given by the following pdf:*

$$f_{\Gamma(\alpha,\beta)}(x) = \frac{1}{\Gamma(\alpha)\beta^\alpha} x^{\alpha-1} e^{-x/\beta}$$