A Mathematical formulas

$$\text{Q-function}: \quad Q(x) = \frac{1}{\sqrt{2\pi}} \int_x^\infty e^{-\frac{t^2}{2}}\, dt \tag{1}$$

$$Q(x) = 1 - Q(-x) \tag{2}$$

$$\text{Error function}: \quad \operatorname{erf}(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2}\, dt \tag{3}$$

$$\operatorname{erfc}(x) = 1 - \operatorname{erf}(x) \tag{4}$$

$$Q(x) = \frac{1}{2}\operatorname{erfc}\left(\frac{x}{\sqrt{2}}\right) \tag{5}$$

$$\text{PDF of } \mathcal{N}(\mu,\sigma^2): \quad f_X(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \tag{6}$$

$$\text{CDF of } \mathcal{N}(\mu,\sigma^2): \quad F_X(x) = 1 - Q\left(\frac{x-\mu}{\sigma}\right) \tag{7}$$

$$\int_{-\infty}^{a_1} \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}}\, dx = Q\left(\frac{\mu - a_1}{\sigma}\right) \tag{8}$$

$$\int_{a_2}^{\infty} \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}}\, dx = Q\left(\frac{a_2 - \mu}{\sigma}\right) \tag{9}$$

$$\int_0^\infty Q(\sqrt{ax}) e^{-x}\, dx = \frac{1}{2}\left(1 - \sqrt{\frac{a}{2+a}}\right);\ a > 0 \tag{10}$$

$$\sqrt{\frac{x}{1+x}} \approx 1 - \frac{1}{2x} \text{for large } x \tag{11}$$

$$e^x = \sum_{k=0}^{\infty} \frac{x^k}{k!} \tag{12}$$

$$\int_0^\infty e^{-ax}\, dx = \frac{1}{a};\ a > 0 \tag{13}$$

$$\int_0^t e^{-ax}\, dx = \frac{1 - e^{-at}}{a};\ a > 0 \tag{14}$$