Mathematical Formulas

$$\sin x = \pm\cos(x \mp 90°)$$

$$\cos x = \pm\sin(x \pm 90°)$$

$$\sin x = -\sin(x \pm 180°)$$

$$\cos x = -\cos(x \pm 180°)$$

$$\sin(-x) = -\sin x$$

$$\cos(-x) = \cos x$$

$$\sin^2 x = \frac{1}{2}(1 - \cos 2x)$$

$$\cos^2 x = \frac{1}{2}(1 + \cos 2x)$$

$$\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$$

$$\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$$

$$2\sin x \sin y = \cos(x - y) - \cos(x + y)$$

$$2\sin x \cos y = \sin(x + y) + \sin(x - y)$$

$$2\cos x \cos y = \cos(x + y) + \cos(x - y)$$

$$\sin 2x = 2\sin x \cos x$$

$$\cos 2x = 1 - 2\sin^2 x$$

$$\sum_{n=0}^{N-1} r^n = \begin{cases} \dfrac{1 - r^N}{1 - r}, & r \neq 1 \\ N, & r = 1 \end{cases}$$

$$\sum_{n=0}^{\infty} r^n = \frac{1}{1-r}, \quad |r| < 1$$

$$\sum_{n=k}^{\infty} r^n = \frac{r^k}{1-r}, \quad |r| < 1$$

$$\sum_{n=0}^{\infty} nr^n = \frac{r}{(1-r)^2}, \quad |r| < 1$$

$$\int \sin ax \, dx = -\frac{1}{a}\cos ax$$

$$\int \cos ax \, dx = \frac{1}{a}\sin ax$$

$$\int e^{ax} \, dx = \frac{1}{a}e^{ax}$$

$$\int \ln x \, dx = x \ln x - x$$

$$\int xe^{ax} \, dx = \frac{e^{ax}}{a^2}(ax - 1)$$

$$\int x^2 e^{ax} \, dx = \frac{e^{ax}}{a^3}(a^2 x^2 - 2ax + 2)$$

$$\int x \sin ax \, dx = \frac{1}{a^2}\sin ax - \frac{x}{a}\cos ax$$

$$\int x \cos ax \, dx = \frac{1}{a^2}\cos ax + \frac{x}{a}\sin ax$$

$$\int x^2 \sin ax \, dx = \frac{2x}{a^2}\sin ax - \frac{a^2 x^2 - 2}{a^3}\cos ax$$

$$\int x^2 \cos ax \, dx = \frac{2x}{a^2}\cos ax + \frac{a^2 x^2 - 2}{a^3}\sin ax$$

$$\frac{a}{b + j\omega} = \frac{a \, e^{-j\tan^{-1}\left(\frac{\omega}{b}\right)}}{\sqrt{b^2 + \omega^2}}$$

$$\frac{j\omega c}{d + j\omega} = \frac{\omega c \, e^{j\tan^{-1}\left(\frac{d}{\omega}\right)}}{\sqrt{d^2 + \omega^2}}$$