

# Trigonometric Identities

## Addition Formulas

$$\begin{aligned}\cos(x-y) &= \cos x \cos y + \sin x \sin y \\ \cos(x+y) &= \cos x \cos y - \sin x \sin y\end{aligned}$$

$$\begin{aligned}\sin(x-y) &= \sin x \cos y - \cos x \sin y \\ \sin(x+y) &= \sin x \cos y + \cos x \sin y\end{aligned}$$

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

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

$$\cos(2x) = \cos^2 x - \sin^2 x$$

$$\sin(2x) = 2 \sin x \cos x$$

## Double Angle Formulas

$$\cos(2x) = \cos^2 x - (1 - \cos^2 x) = 2\cos^2 x - 1$$

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

$$\cos(2x) = 2\cos^2 x - 1$$

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

$$2\cos^2 x = 1 + \cos(2x)$$

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

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

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

$$\cos x = \pm \sqrt{\frac{1 + \cos 2x}{2}}$$

$$\sin x = \pm \sqrt{\frac{1 - \cos 2x}{2}}$$

## Power Reducing Formulas

$$\cos\left(\frac{\theta}{2}\right) = \pm \sqrt{\frac{1 + \cos \theta}{2}}$$

$$\sin\left(\frac{\theta}{2}\right) = \pm \sqrt{\frac{1 - \cos \theta}{2}}$$

## Half Angle Formulas