

# Trigonometric Functions

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$$\sin^2 \alpha + \cos^2 \alpha = 1$$

$$\sin(\alpha \pm \beta) = \sin \alpha \cos \beta \pm \cos \alpha \sin \beta$$

$$\cos(\alpha \pm \beta) = \cos \alpha \cos \beta \mp \sin \alpha \sin \beta$$

$$\tan(\alpha \pm \beta) = \frac{\tan \alpha \pm \tan \beta}{1 \mp \tan \alpha \tan \beta}$$

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

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

$$\sin(3\alpha) = 3 \sin \alpha - 4 \sin^3 \alpha$$

$$\cos(3\alpha) = 4 \cos^3 \alpha - 3 \cos \alpha$$

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

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

$$\sin \alpha + \cos \beta = 2 \sin \frac{1}{2}(\alpha + \beta) \cos \frac{1}{2}(\alpha - \beta)$$

$$\sin \alpha - \cos \beta = 2 \cos \frac{1}{2}(\alpha + \beta) \sin \frac{1}{2}(\alpha - \beta)$$

$$\cos \alpha + \cos \beta = 2 \cos \frac{1}{2}(\alpha + \beta) \cos \frac{1}{2}(\alpha - \beta)$$

$$\cos \alpha - \cos \beta = -2 \sin \frac{1}{2}(\alpha + \beta) \sin \frac{1}{2}(\alpha - \beta)$$

$$\sin \alpha = \frac{1}{2i}(e^{i\alpha} - e^{-i\alpha})$$

$$\cos \alpha = \frac{1}{2}(e^{i\alpha} + e^{-i\alpha})$$