

Negative Angle Identities

$$\begin{aligned}\sin(-\theta) &= -\sin\theta & \csc(-\theta) &= -\csc\theta \\ \cos(-\theta) &= \cos\theta & \sec(-\theta) &= \sec\theta \\ \tan(-\theta) &= -\tan\theta & \cot(-\theta) &= -\cot\theta\end{aligned}$$

Addition and Subtraction Identities

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Double Angle Identities

$$\sin 2\theta = 2\sin\theta \cos\theta$$

$$\cos 2\theta = \cos^2\theta - \sin^2\theta$$

$$= 2\cos^2\theta - 1$$

$$= 1 - 2\sin^2\theta$$

$$\tan 2\theta = \frac{2\tan\theta}{1 - \tan^2\theta}$$

Product Identities

$$\sin A \cos B = \frac{1}{2} \left(\sin(A + B) + \sin(A - B) \right)$$

$$\cos A \sin B = \frac{1}{2} \left(\sin(A + B) - \sin(A - B) \right)$$

$$\cos A \cos B = \frac{1}{2} \left(\cos(A + B) + \cos(A - B) \right)$$

$$\sin A \sin B = \frac{1}{2} \left(\cos(A - B) - \cos(A + B) \right)$$

Co-function Identities If $A + B = \frac{\pi}{2}$

$$\sin A = \cos B$$

$$\sec A = \csc B$$

$$\tan A = \cot B$$

Quotient Identities

$$\csc\theta = \frac{1}{\sin\theta} \quad \tan\theta =$$

$$\sec\theta = \frac{1}{\cos\theta} \quad \cot\theta = \frac{1}{\tan\theta} = \frac{\cos\theta}{\sin\theta}$$

Pythagorean Identities

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

$$1 + \tan^2\theta = \sec^2\theta$$

$$1 + \cot^2\theta = \csc^2\theta$$

Half-Angle Identities

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

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

$$\tan \frac{\theta}{2} = \pm \sqrt{\frac{1 - \cos\theta}{1 + \cos\theta}}$$

Sum Identities

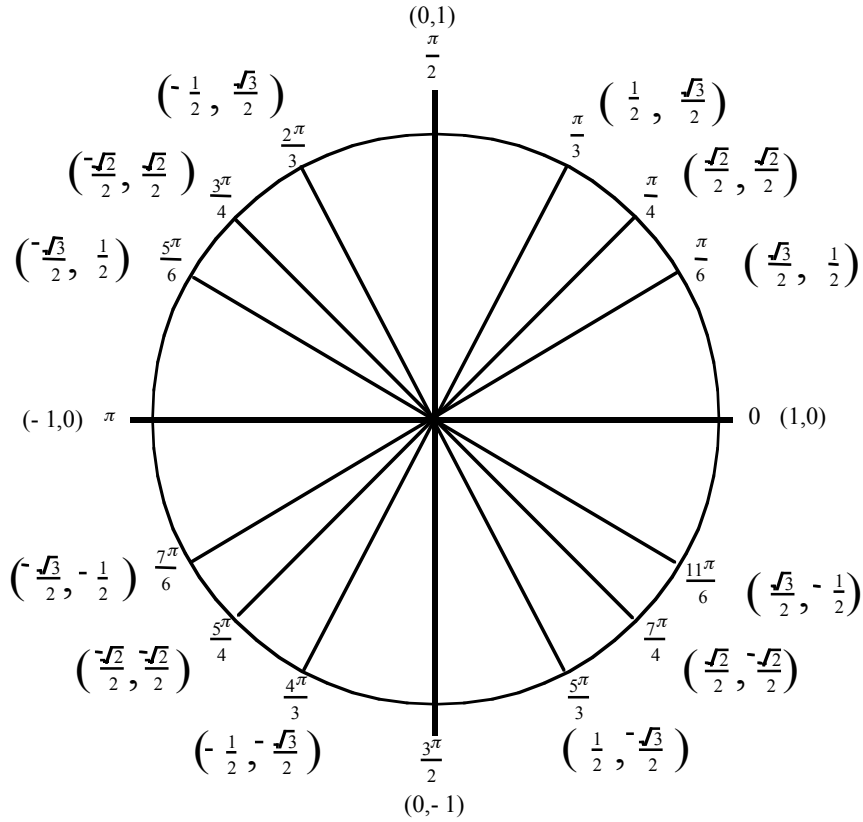
$$\sin A + \sin B = 2\sin\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)$$

$$\sin A - \sin B = 2\cos\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right)$$

$$\cos A + \cos B = 2\cos\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)$$

$$\cos A - \cos B = -2\sin\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right)$$

THE UNIT CIRCLE

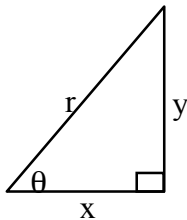


TRIGONOMETRIC DEFINITIONS

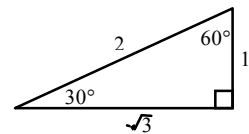
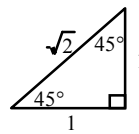
$$\sin \theta = \frac{y}{r} = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{x}{r} = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{y}{x} = \frac{\text{opposite}}{\text{adjacent}}$$



SPECIAL ANGLE TRIANGLES



or if it is the unit circle,

