Trigonometric Identities:

Reciprocal Identities

$$\cot(\theta) = \frac{1}{\tan(\theta)} \qquad \sec(\theta) = \frac{1}{\cos(\theta)} \qquad \csc(\theta) = \frac{1}{\sin(\theta)}$$

Quotient Identities

$$\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)} \qquad \cot(\theta) = \frac{\cos(\theta)}{\sin(\theta)}$$

Pythagorean Identities

$$\sin^2(\theta) + \cos^2(\theta) = 1 \qquad \tan^2(\theta) + 1 = \sec^2(\theta) \qquad 1 + \cot^2(\theta) = \csc^2(\theta)$$

Even-Odd Identites

$$\sin(-\theta) = -\sin(\theta) \qquad \cos(-\theta) = \cos(\theta) \qquad \tan(-\theta) = -\tan(\theta)$$
$$\csc(-\theta) = -\csc(\theta) \qquad \sec(-\theta) = \sec(\theta) \qquad \cot(-\theta) = -\cot(\theta)$$

Cofunction Identities

$$\cos(\theta) = \sin\left(\frac{\pi}{2} - \theta\right) \qquad \cot(\theta) = \tan\left(\frac{\pi}{2} - \theta\right) \qquad \csc(\theta) = \sec\left(\frac{\pi}{2} - \theta\right)$$
$$\sin(\theta) = \cos\left(\frac{\pi}{2} - \theta\right) \qquad \tan(\theta) = \cot\left(\frac{\pi}{2} - \theta\right) \qquad \sec(\theta) = \csc\left(\frac{\pi}{2} - \theta\right)$$

Sum and Difference Identities

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

Double-angle Formulas

$$\cos(2A) = \cos^2(A) - \sin^2(A) \qquad \cos(2A) = 1 - 2\sin^2(A) \qquad \cos(2A) = 2\cos^2(A) - 1$$
$$\sin(2A) = 2\sin(A)\cos(A) \qquad \tan(2A) = \frac{2\tan(A)}{1 - \tan^2(A)}$$

Product-to-Sum Identities

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

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

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

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

Sum-to-Product Identities

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

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

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

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

Half-Angle Identities

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

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

$$\tan\left(\frac{A}{2}\right) = \pm\sqrt{\frac{1-\cos(A)}{1+\cos(A)}} \qquad \tan\left(\frac{A}{2}\right) = \frac{\sin(A)}{1+\cos(A)} \qquad \tan\left(\frac{A}{2}\right) = \frac{1-\cos(A)}{\sin(A)}$$