Pythagorean Identities

$$\sin^2 x + \cos^2 x = 1 \qquad 1 + \tan^2 x = \sec^2 x \qquad 1 + \cot^2 x = \csc^2 x$$

Even/Odd Identities

$$\sin(-x) = -\sin(x) \qquad \cos(-x) = \cos(x) \qquad \tan(-x) = -\tan(x)$$

Co-Function Identities

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

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

Addition and Subtraction Identities

$$\sin(a+b) = \sin(a)\cos(b) + \cos(a)\sin(b)$$

$$\sin(a-b) = \sin(a)\cos(b) - \cos(a)\sin(b)$$

$$\cos(a+b) = \cos(a)\cos(b) - \sin(a)\sin(b)$$

$$\cos(a-b) = \cos(a)\cos(b) + \sin(a)\sin(b)$$

$$\tan(a+b) = \frac{\tan(a)+\tan(b)}{1-\tan(a)\tan(b)} \qquad \tan(a-b) = \frac{\tan(a)-\tan(b)}{1+\tan(a)\tan(b)}$$

Double Angle Identities

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

Half Angle Identities

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

Law of Cosines

$$c^2 = a^2 + b^2 - 2ab\mathrm{Cos}(C)$$

Law of Sines

$$\frac{a}{\mathrm{Sin}(A)} = \frac{b}{\mathrm{Sin}(B)} = \frac{c}{\mathrm{Sin}(C)}$$

Triangle Area Formulas

$$\text{Area} = \tfrac{1}{2}ab\mathrm{Sin}(C) \qquad \text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

Angle Between Vectors $\vec{u}$ and $\vec{v}$

$$\cos(\theta) = \frac{\vec{u}\cdot\vec{v}}{\|\vec{u}\| * \|\vec{v}\|}$$