Pythagorean Identities

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

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

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

Even/Odd Identities

$$\sin(-\mathbf{x}) = -\sin(\mathbf{x})$$

$$\cos(-x) = \cos(x)$$

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

Co-Function Identities

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

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

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

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

$$\csc\left(\frac{x}{2} - x\right) = \sec(x)$$

Addition and Subtraction Identities

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

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

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

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

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

Double Angle Identities

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

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

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

Half Angle Identities

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

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

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

Law of Cosines

Law of Sines

$$c^2 = a^2 + b^2 - 2abCos(C)$$

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

Triangle Area Formulas

Area =
$$\frac{1}{2}$$
abSin(C)

Area =
$$\sqrt{s(s-a)(s-b)(s-c)}$$

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

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