Trigonometric Identities Cheat sheet

Inverse functions

$$\sin = \frac{1}{\csc} \qquad \csc = \frac{1}{\sin}$$

$$\cos = \frac{1}{\sec} \qquad \sec = \frac{1}{\cos}$$

$$\tan = \frac{\sin}{\cos} \qquad \cot = \frac{\cos}{\sin}$$

Fundamental Identities

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

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

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

Complimentary Angles

$$\sin(\frac{\pi}{2} - \alpha) = \cos(\alpha) \qquad \cos(\frac{\pi}{2} - \alpha) = \sin(\alpha)$$

$$\sec(\frac{\pi}{2} - \alpha) = \csc(\alpha) \qquad \csc(\frac{\pi}{2} - \alpha) = \sec(\alpha)$$

$$\tan(\frac{\pi}{2} - \alpha) = \cot(\alpha) \qquad \cot(\frac{\pi}{2} - \alpha) = \tan(\alpha)$$

Complimentary with Identities

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

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

Odd and Even Functions

$$\sin(-\alpha) = -\sin(\alpha) \qquad \csc(-\alpha) = -\csc(\alpha)$$

$$\tan(-\alpha) = -\tan(\alpha) \qquad \cot(-\alpha) = -\cot(\alpha)$$

$$\cos(-\alpha) = \cos(\alpha) \qquad \sec(-\alpha) = \sec(\alpha)$$

Sum and Difference Formulas

$$\sin(\alpha + \beta) = \sin(\alpha) * \cos(\beta) + \cos(\alpha) * \sin(\beta)$$

$$\sin(\alpha - \beta) = \sin(\alpha) * \cos(\beta) - \cos(\alpha) * \sin(\beta)$$

$$\cos(\alpha + \beta) = \cos(\alpha) * \cos(\beta) - \sin(\alpha) * \sin(\beta)$$

$$\cos(\alpha - \beta) = \cos(\alpha) * \cos(\beta) + \sin(\alpha) * \sin(\beta)$$

$$\tan(\alpha + \beta) = \frac{\tan(\alpha) + \tan(\beta)}{1 - \tan(\alpha) * \tan(\beta)}$$

$$\tan(\alpha - \beta) = \frac{\tan(\alpha) - \tan(\beta)}{1 + \tan(\alpha) * \tan(\beta)}$$

Double Angle Formulas

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

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

$$\begin{aligned} \cos(2 * \alpha) &= 2 * \cos^2(\alpha) - 1 \\ &= 1 - 2 * \sin * 2(\alpha) \\ &= cos^2(\alpha) - sin^2(\alpha) \end{aligned}$$

Half Angle Formula (not $\pm$; + or - depending on quadrant of $\frac{u}{2}$)

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

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

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