

# Trigonometric Identities Cheat sheet

## Inverse functions

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

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

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

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

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

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

## Fundamental Identities

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

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

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

## Complimentary Angles

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

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

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

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

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

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

## Complimentary with Identities

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

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

## Odd and Even Functions

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

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

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

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

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

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

## 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

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

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

$$\cos(2 * \alpha) = 2 * \cos^2(\alpha) - 1$$

$$= 1 - 2 * \sin^2(\alpha)$$

$$= \cos^2(\alpha) - \sin^2(\alpha)$$

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

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

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

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