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Table of Trigonometric Identities

Reciprocal identities

$$\sin u = \frac{1}{\csc u} \quad \cos u = \frac{1}{\sec u} \quad \tan u = \frac{1}{\cot u}$$

$$\csc u = \frac{1}{\sin u} \quad \sec u = \frac{1}{\cos u} \quad \cot u = \frac{1}{\tan u}$$

Pythagorean Identities

$$\sin^2 u + \cos^2 u = 1 \quad 1 + \tan^2 u = \sec^2 u \quad 1 + \cot^2 u = \csc^2 u$$

Quotient Identities

$$\tan u = \frac{\sin u}{\cos u} \quad \cot u = \frac{\cos u}{\sin u}$$

Co-Function Identities

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

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

Even-Odd Identities

$$\begin{aligned} \sin(-x) &= -\sin x & \cos(-x) &= \cos x & \tan(-x) &= -\tan x \\ \csc(-x) &= -\csc x & \sec(-x) &= \sec x & \cot(-x) &= -\cot x \end{aligned}$$

Sum-Difference Formulas

$$\sin(u \pm v) = \sin u \cos v \pm \cos u \sin v$$

$$\cos(u \pm v) = \cos u \cos v \mp \sin u \sin v$$

$$\tan(u \pm v) = \frac{\tan u \pm \tan v}{1 \mp \tan u \tan v}$$

Double Angle Formulas

$$\begin{aligned}\sin(2u) &= 2 \sin u \cos u \\ \cos(2u) &= \cos^2 u - \sin^2 u \\ &= 2 \cos^2 u - 1 \\ &= 1 - 2 \sin^2 u \\ \tan(2u) &= \frac{2 \tan u}{1 - \tan^2 u}\end{aligned}$$

Power-Reducing/Half Angle Formulas

$$\begin{aligned}\sin^2 u &= \frac{1 - \cos(2u)}{2} \\ \cos^2 u &= \frac{1 + \cos(2u)}{2} \\ \tan^2 u &= \frac{1 - \cos(2u)}{1 + \cos(2u)}\end{aligned}$$

Sum-to-Product Formulas

$$\begin{aligned}\sin u + \sin v &= 2 \sin \left(\frac{u+v}{2} \right) \cos \left(\frac{u-v}{2} \right) \\ \sin u - \sin v &= 2 \cos \left(\frac{u+v}{2} \right) \sin \left(\frac{u-v}{2} \right) \\ \cos u + \cos v &= 2 \cos \left(\frac{u+v}{2} \right) \cos \left(\frac{u-v}{2} \right) \\ \cos u - \cos v &= -2 \sin \left(\frac{u+v}{2} \right) \sin \left(\frac{u-v}{2} \right)\end{aligned}$$

Product-to-Sum Formulas

$$\begin{aligned}\sin u \sin v &= \frac{1}{2} [\cos(u-v) - \cos(u+v)] \\ \cos u \cos v &= \frac{1}{2} [\cos(u-v) + \cos(u+v)] \\ \sin u \cos v &= \frac{1}{2} [\sin(u+v) + \sin(u-v)] \\ \cos u \sin v &= \frac{1}{2} [\sin(u+v) - \sin(u-v)]\end{aligned}$$

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[Luis Valdez-Sanchez](#)

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