

TRIGONOMETRIC IDENTITIES

Even-Odd Identities.

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

Addition/Subtraction Formulas.

- $\sin(x + y) = \sin x \cos y + \cos x \sin y$
- $\sin(x - y) = \sin x \cos y - \cos x \sin y$
- $\cos(x + y) = \cos x \cos y - \sin x \sin y$
- $\cos(x - y) = \cos x \cos y + \sin x \sin y$
- $\tan(x + y) = \frac{\tan x + \tan y}{1 - \tan x \tan y}$
- $\tan(x - y) = \frac{\tan x - \tan y}{1 + \tan x \tan y}$

Reduction of Powers Formulas.

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

Product-To-Sum Formulas.

- $\sin x \cos y = \frac{1}{2} [\sin(x + y) + \sin(x - y)]$
- $\cos x \sin y = \frac{1}{2} [\sin(x + y) - \sin(x - y)]$
- $\cos x \cos y = \frac{1}{2} [\cos(x + y) + \cos(x - y)]$
- $\sin x \sin y = \frac{1}{2} [\cos(x - y) - \cos(x + y)]$

Cofunction Identities.

- $\sin(\frac{\pi}{2} - x) = \cos x$
- $\cos(\frac{\pi}{2} - x) = \sin x$
- $\sec(\frac{\pi}{2} - x) = \csc x$
- $\csc(\frac{\pi}{2} - x) = \sec x$
- $\tan(\frac{\pi}{2} - x) = \cot x$
- $\cot(\frac{\pi}{2} - x) = \tan x$

Double-Angle Formulas.

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

Half-Angle Formulas.

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

Sum-To-Product Formulas.

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