

Fundamental Trigonometric Identities

Reciprocal Identities

$$\begin{array}{lll} \sin u = \frac{1}{\csc u} & \cos u = \frac{1}{\sec u} & \tan u = \frac{1}{\cot u} \\ \csc u = \frac{1}{\sin u} & \sec u = \frac{1}{\cos u} & \cot u = \frac{1}{\tan u} \end{array}$$

Quotient Identities

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

Pythagorean Identities

$$\begin{array}{lll} \sin^2 u + \cos^2 u = 1 & 1 + \tan^2 u = \sec^2 u & 1 + \cot^2 \theta = \csc^2 \theta \\ (\sin^2 u = 1 - \cos^2 u) & (\tan^2 u = \sec^2 u - 1) & (\cot^2 \theta = \csc^2 \theta - 1) \\ (\cos^2 u = 1 - \sin^2 u) & (\tan^2 u - \sec^2 u = 1) & (\cot^2 \theta - \csc^2 \theta = 1) \end{array}$$

Trigonometry Formulas

Sum and Difference Formulas

$$\begin{array}{l} \sin(u + v) = \sin u \cos v + \cos u \sin v \\ \sin(u - v) = \sin u \cos v - \cos u \sin v \\ \cos(u + v) = \cos u \cos v - \sin u \sin v \\ \cos(u - v) = \cos u \cos v + \sin u \sin v \\ \tan(u + v) = \frac{\tan u + \tan v}{1 - \tan u \tan v} \\ \tan(u - v) = \frac{\tan u - \tan v}{1 + \tan u \tan v} \end{array}$$

Double-Angle Formulas

$$\begin{array}{l} \sin 2u = 2 \sin u \cos u \\ \cos 2u = \cos^2 u - \sin^2 u \\ \qquad \qquad = 2 \cos^2 u - 1 \\ \qquad \qquad = 1 - 2 \sin^2 u \\ \tan 2u = \frac{2 \tan u}{1 - \tan^2 u} \end{array}$$
