TRIGONOMETRY

$$\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$$
$$\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$$
$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}$$
$$\cot(x \pm y) = \frac{\cot x \cot y \mp 1}{\cot y \pm \cot x}$$

$$\cos C + \cos D = 2\cos\left(\frac{C+D}{2}\right)\cdot\cos\left(\frac{C-D}{2}\right)$$
$$\cos C - \cos D = 2\sin\left(\frac{C+D}{2}\right)\cdot\sin\left(\frac{D-C}{2}\right)$$
$$\sin C + \sin D = 2\sin\left(\frac{C+D}{2}\right)\cdot\cos\left(\frac{C-D}{2}\right)$$
$$\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right)\cdot\sin\left(\frac{C-D}{2}\right)$$

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

$$\tan 2x = \frac{2\tan x}{1-\tan^2 x} \qquad \sin(3x) = 3\sin x - 4\sin^3 x$$

$$\cos(3x) = 4\cos^3 x - 3\cos x \qquad \tan(3x) = \frac{3\tan x - \tan^3 x}{1 - 3\tan^2 x}$$

INVERSE TRIGONOMETRY

$$\sin^{-1}(-x) = -\sin^{-1}(x)$$
$$\tan^{-1}(-x) = -\tan^{-1}(x)$$
$$\cot^{-1}(-x) = \pi - \cot^{-1}(x)$$
$$\sec^{-1}(-x) = \pi - \sec^{-1}(x)$$
$$\operatorname{cosec}^{-1}(-x) = -\operatorname{cosec}^{-1}(x)$$
$$\cos^{-1}(-x) = \pi - \cos^{-1}(x)$$

$$\sin^{-1}(x) + \cos^{-1}(x) = \pi/2$$
$$\tan^{-1}(x) + \cot^{-1}(x) = \pi/2$$
$$\operatorname{cosec}^{-1}(x) + \sec^{-1}(x) = \pi/2$$

$$\sin^{-1}\left(\frac{1}{x}\right) = \operatorname{cosec}^{-1}(x)$$
$$\cos^{-1}\left(\frac{1}{x}\right) = \sec^{-1}(x)$$
$$\tan^{-1}\left(\frac{1}{x}\right) = \cot^{-1}(x)$$

$$\tan^{-1}(x) \pm \tan^{-1}(y) = \tan^{-1}\left(\frac{x \pm y}{1 \mp xy}\right)$$

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