TRIG CHEAT SHEET
IDENTITIES & FORMULAS

QUOTIENT IDENTITIES

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

$$\cot \theta = \frac{\cos \theta}{\sin e \, \theta}$$

RECIPROCAL IDENTITIES

$$\cot \theta = \frac{1}{\tan \theta}$$

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

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

PYTHAGOREAN IDENTITIES

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

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

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

CO-FUNCTION IDENTITIES

$$\cos\left[\frac{\pi}{2} - \theta\right] = \sin \theta$$

$$\sin\left[\frac{\pi}{2} - \theta\right] = \cos \theta$$

$$\cot\left[\frac{\pi}{2} - 0\right] = \tan \theta$$

$$\tan\left[\frac{\pi}{2} - \theta\right] = \cot \theta$$

$$\sec\left[\frac{\pi}{2} - \theta\right] = \csc \theta$$

$$\csc\left[\frac{\pi}{2} - \theta\right] = \sec \theta$$

EVEN-ODD FORMULAS

$$\sin(-\theta) = -\sin \theta$$

$$\cos(-\theta) = \cos \theta$$

$$\tan(-\theta) = -\tan \theta$$

$$\cot(-\theta) = -\cot \theta$$

$$\sec(-\theta) = \sec \theta$$

$$\csc(-\theta) = -\csc \theta$$

HALF ANGLE FORMULAS

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

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

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

$$= \frac{\sin \alpha}{1 + \cos \alpha}$$

$$= \frac{1 - \cos \alpha}{\sin \alpha}$$

DOUBLE ANGLE FORMULAS

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$= \frac{2 \tan \alpha}{1 + \tan^2\alpha}$$

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

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

$$= 2 \cos^2\alpha - 1$$

$$= 1 - 2\sin^2\alpha$$

$$= \frac{1 - \tan^2\alpha}{1 + \tan^2\alpha}$$

PRODUCT TO SUM FORMULA

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

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

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

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

SUM TO PRODUCT FORMULA

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

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

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

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

TRIPLE ANGLE FORMULAS

$$\sin 3\theta = 3\sin\theta - 4\sin^3\theta$$

$$\cos 3\theta = 4\cos^3\theta - 3\cos\theta$$

$$\tan 3\theta = \frac{(3\tan\theta - \tan^3\theta)}{(1 - 3\tan^2\theta)}$$

$$\csc 3\theta = \frac{1}{(3\sin\theta - 4\sin^3\theta)}$$

$$\sec 3\theta = \frac{1}{(4\cos^3\theta - 3\cos\theta)}$$

$$\cot 3\theta = \frac{(1 - 3\tan^2\theta)}{(3\tan\theta - \tan^3\theta)}$$