Trigonometric Identities Cheat sheet

Inverse functions

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

Fundamental Identities

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

Complimentary Angles

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

Complimentary with Identities

$$\sin^2(u) + \sin^2(\frac{\pi}{2} - u) = 1$$
$$\cos^2(u) + \cos^2(\frac{\pi}{2} - u) = 1$$

Odd and Even Functions

$$\sin(-u) = -\sin(u) \qquad \csc(-u) = -\csc(u)$$
$$\tan(-u) = -\tan(u) \qquad \cot(-u) = -\cot(u)$$
$$\cos(-u) = \cos(u) \qquad \sec(-u) = \sec(u)$$

Sum and Difference Formulas

$$\sin(u + v) = \sin(u) * \cos(v) + \cos(u) * \sin(v)$$
$$\sin(u - v) = \sin(u) * \cos(v) - \cos(v) * \sin(v)$$
$$\cos(u + v) = \cos(u) * \cos(v) - \sin(u) * \sin(v)$$
$$\cos(u - v) = \cos(u) * \cos(v) + \sin(u) * \sin(v)$$
$$\tan(u + v) = \frac{\tan(u) + \tan(v)}{1 - \tan(u) * \tan(v)}$$
$$\tan(u - v) = \frac{\tan(u) - \tan(v)}{1 + \tan(u) * \tan(v)}$$

Double Angle Formulas

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

Half Angle Formula (not $\pm$; + or - depending on quadrant of $\frac{u}{2}$)

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