Trigonometry Identities
Math 170 "Pre-Calculus"

*Reciprocal Identities:

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

*Quotient Identities:

$$\tan x = \frac{\sin x}{\cos x}$$
$$\cot x = \frac{\cos x}{\sin x}$$

*Pythagorean Identities:

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

Double Angle Identities:

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

Half-Angle Identities:

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

Sum and Difference Identities:

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

Even/Odd Identities:
Identities:

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

Cofunction

$$\sin\left(\frac{\pi}{2} - u\right) = \cos u$$
$$\tan\left(\frac{\pi}{2} - u\right) = \cot u$$
$$\cos\left(\frac{\pi}{2} - u\right) = \sin u$$

* Must have these memorized for Test and Final Exam*