5-1 Pythagorean Identities

Identity:
equality that is true for all values of the domain for both expressions as long as they are both defined

$$\tan\theta \cdot \cos\theta = \sin\theta$$

this is true for all θ, as long as sinθ, cosθ, and tanθ are defined

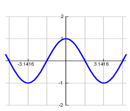
Reciprocal & Quotient Relationships

$\sin\theta = \dfrac{1}{\csc\theta}$ $\quad \csc\theta = \dfrac{1}{\sin\theta}$ $\quad \tan\theta = \dfrac{\sin\theta}{\cos\theta}$

$\cos\theta = \dfrac{1}{\sec\theta}$ $\quad \sec\theta = \dfrac{1}{\cos\theta}$ $\quad \cot\theta = \dfrac{\cos\theta}{\sin\theta}$

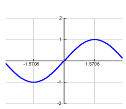
$\tan\theta = \dfrac{1}{\cot\theta}$ $\quad \cot\theta = \dfrac{1}{\tan\theta}$

Odd/Even Identities



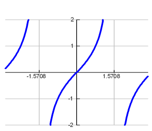
$$\cos(-x) = \cos x$$

$$\sec(-x) = \sec x$$



$$\sin(-x) = -\sin x$$

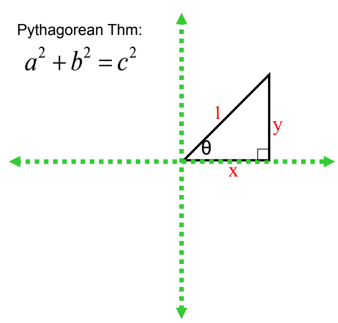
$$\csc(-x) = -\csc x$$



$$\tan(-x) = -\tan x$$

$$\cot(-x) = -\cot x$$

Pythagorean Thm:
$a^2 + b^2 = c^2$



Can we write an equation about the relationship of x, y, and r?

$\sin\theta =$

$\cos\theta =$

Pythagorean Relationships

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

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

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

Now lets divide by $\cos^2\theta$

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

Pythagorean Relationships

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

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

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

Now lets divide by $\sin^2\theta$

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

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

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

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

Pythagorean Relationships

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

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

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

Simplify:

$\cot x \tan x$

$\sin\theta\csc\theta$

$\sin x \csc(-x)$

$\dfrac{\sec^2 x}{\tan^2 x}$

5-1

Simplify

$$\frac{\sec x}{\sin x}-\frac{\sin x}{\cos x}$$

Simplify:

$$\frac{1}{\sin\alpha-1}-\frac{1}{\sin\alpha+1}$$

Establish the Identity:

$$\csc x\cos x=\cot x$$

$$\left(1-\sin^2 x\right)\left(1+\tan^2 x\right)=1$$

$$\cos x(\tan x+\cot x)=\csc x$$