5.1 Fundamental Identities

What does the word identity mean to you?

Identity:

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

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

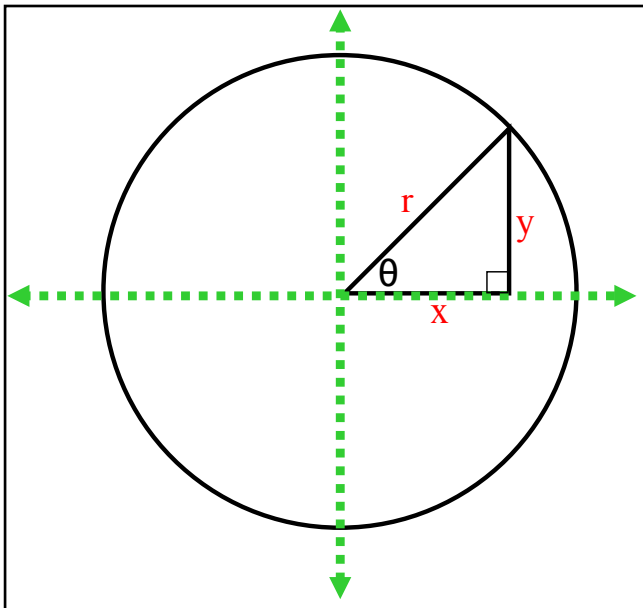
this is true for all θ, as long as sinθ, cosθ, and tanθ are defined

Reciprocal & Quotient Relationships

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

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

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



Pythagorean Relationships

$$x^2 + y^2 = r^2$$

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

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

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

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

Pythagorean Relationships

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

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

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

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

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

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

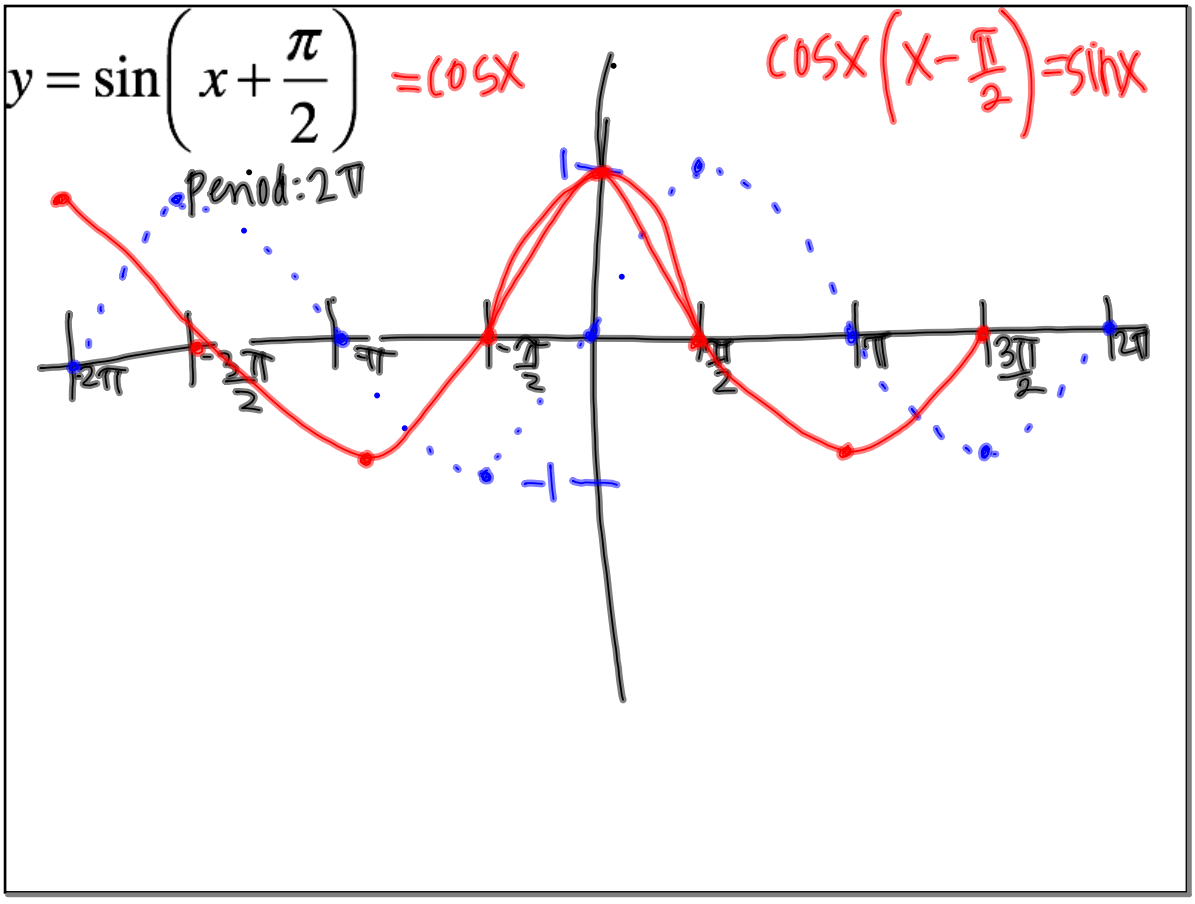
$$\cot^2\theta = \csc^2\theta - 1$$

Pythagorean Relationships

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

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

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



Co-Function Identities

$$\sin\left(\frac{\pi}{2}-\theta\right)=\cos\theta \qquad \cos\left(\frac{\pi}{2}-\theta\right)=\sin\theta$$

$$\tan\left(\frac{\pi}{2}-\theta\right)=\cot\theta \qquad \cot\left(\frac{\pi}{2}-\theta\right)=\tan\theta$$

$$\sec\left(\frac{\pi}{2}-\theta\right)=\csc\theta \qquad \csc\left(\frac{\pi}{2}-\theta\right)=\sec\theta$$

Odd/Even Identities

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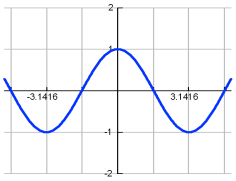
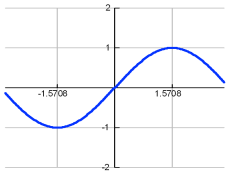


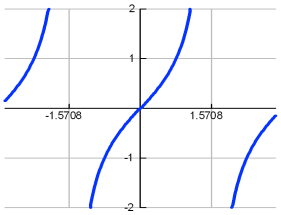
$$\cos(-x)=\cos x$$

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



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

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



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

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

Simplify:

$\sin x \csc(-x)$

$\cot x \tan x$

Perfect Squares:

$x^2 - 8x + 16$

$x^2 + 14x + 49$

$\sin^2 x - 10 \sin x + 25$

$\cos^2 x + 16 \cos x + 64$

Difference of Squares:

$x^2 - 16$ $\qquad$ $x^2 - 49$

$1 - x^2$ $\qquad$ $1 - \sin^2 x$

$\sin^2 x - \cos^2 x$

Simplify:

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

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

Solve the Equation for $[0, 2\pi)$

$$\tan x \sin^2 x = \tan x$$

How you write all solutions