Today's Plan:

Learning Target (standard): I will establish trigonometric identities.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Find the exact value.

$$\cos 70^\circ \sec 20^\circ$$

$$\cos 70^\circ\left(\frac{1}{\cos 20^\circ}\right)$$

$$\cos 70^\circ\left(\frac{1}{(\sin(90^\circ-20^\circ))}\right)$$

$$\cos 70^\circ\left(\frac{1}{\sin 70^\circ}\right)$$

$$\frac{\cos 70^\circ}{\sin 70^\circ}$$

$$(\cot 70^\circ)$$

$$\cot 70^\circ$$

Find the exact value.

$$1+\tan^2 40^\circ - \csc^2 50^\circ$$

$$(\sec^2 40^\circ) - \csc^2 50^\circ$$

$$(\csc^2(90^\circ - 40^\circ)) - \csc^2 50^\circ$$

$$\csc^2 50^\circ - \csc^2 50^\circ$$

$$0$$

Find the exact value.

$$1-\underline{\sin^2 15^\circ} - \sin^2 75^\circ$$

$$1-(\cos^2(90^\circ - 15^\circ)) - \sin^2 75^\circ$$

$$1-\cos^2 75^\circ - \sin^2 75^\circ$$

$$1-(\sin^2 75^\circ + \cos^2 75^\circ)$$

$$1-(1)$$

$$0$$

Write the 8 Fundamental Properties.

1) Reciprocal:

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

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

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

2) Quotient:

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

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

3) Pythagorean:

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

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

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

* Reciprocal & Quotient Identities apply to any given power of the function *

Known Identities = "Givens"

1) Complementary Angle Theorem

$$\sin\theta = \cos(90° - \theta)$$

$$\cos\theta = \sin(90° - \theta)$$

$$\tan\theta = \cot(90° - \theta)$$

$$\cot\theta = \tan(90° - \theta)$$

$$\sec\theta = \csc(90° - \theta)$$

$$\csc\theta = \sec(90° - \theta)$$

Known Identities = "Givens"

1) Even & Odd Properties

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

Conditional

- a statement that is true only for specific values

$$x + 3 = 4$$

- graphs intersect at a limited number of values

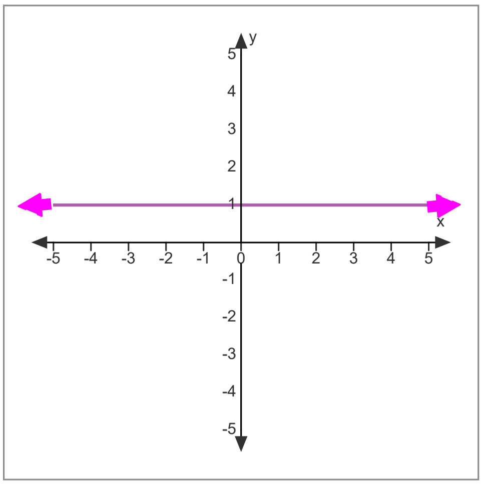
Identity

- a statement that is true for ALL values

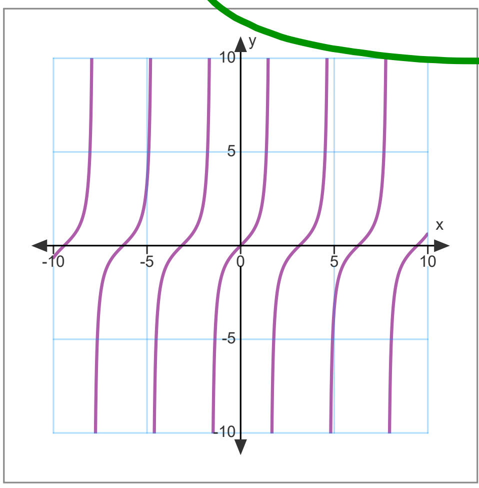
$$2(x+1) = 2x + 2$$

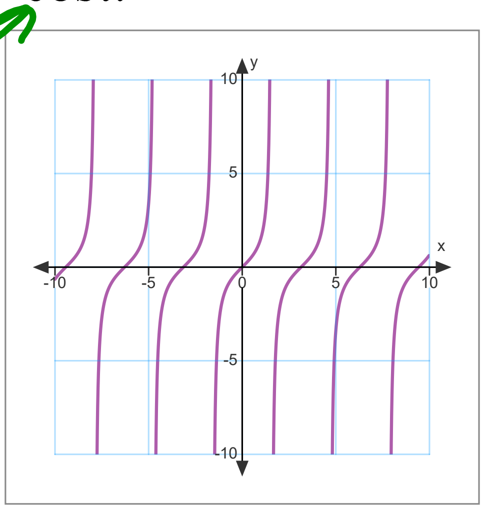
- graphs are identical

$$y = \sin^2 x + \cos^2 x$$

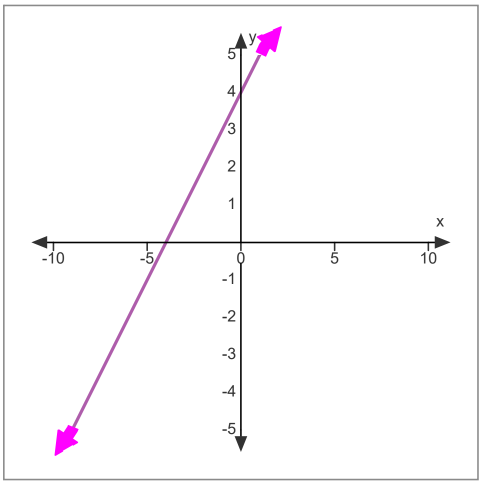


$$y = \tan x \qquad\qquad y = \frac{\sin x}{\cos x}$$





$y = x + 4$ $y = 3$



Establishing/Verifying Identities:

- Choose the side that contains the more "complicated" looking expression - this gives you more options.
- Rewrite sums or differences of quotients as single quotients (common denominators).
- Sometimes rewriting one side in terms of sines and cosines only will help.
- Always keep your goal in mind. As you manipulate one side of the expression, you must keep in mind the form of the expression on the other side.
- Be careful not to handle identities as if they are equations. You CANNOT establish an identity by such methods as adding the same expression to each side and obtaining a true statement. This practice is NOT allowed because the original is what you are trying to establish. In other words, only ONE side of the identity may be manipulated!
- "Given" identities may NOT be manipulated around the equal sign either.
- Parentheses indicate that "substitution" has occurred.

Establish the identity.

$$\cot x \sin x = \cos x$$

$$\left(\frac{\cos x}{\cancel{\sin x}}\right)\cancel{\sin x}$$

$$\cos x$$

$\therefore$ Q.E.D.

Establish the identity.

$$\tan x \cot x = 1$$

$$\cancel{\tan x}\left(\frac{1}{\cancel{\tan x}}\right)$$

$$1$$

$\therefore$ Q.E.D.

Establish the identity.

$$1+\tan^2(-\theta)=\sec^2\theta$$

$1+(\tan(-\theta))^2$

$1+((-\tan\theta))^2$

$1+\tan^2\theta$

$(\sec^2\theta)$

$\sec^2\theta$ $\therefore$ Q.E.D

Establish the identity.

$$\sin^2(-\theta)+\cos^2(-\theta)=1$$

$(\sin(-\theta))^2+(\cos(-\theta))^2$

$((-\sin\theta))^2+((\cos\theta))^2$

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

(1)

1 $\therefore$ Q.E.D.

Establish the identity.

$$\cos\theta\left(\tan\theta+\cot\theta\right)=\csc\theta$$

$$\cos\theta\left(\left(\frac{\sin\theta}{\cos\theta}\right)+\left(\frac{\cos\theta}{\sin\theta}\right)\right)$$

$$\cos\theta\left(\frac{\sin^2\theta}{\sin\theta\cos\theta}+\frac{\cos^2\theta}{\sin\theta\cos\theta}\right)$$

$$\cos\theta\left(\frac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta}\right)$$

$$\cancel{\cos\theta}\left(\frac{(1)}{\sin\theta\cancel{\cos\theta}}\right)$$

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

$$(\csc\theta)$$

$$\csc\theta \quad \therefore \text{Q.E.D.}$$

Assignment:

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