

Section 5.1

Part 6

Using Trigonometric Identities

Objective:

Given an **equation** students will be able to prove the equation is true by using the trig identities.

Study problems

Trig II part 6 wks

Cofunction Identities

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

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

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

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

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

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

Even and Odd Identities

$$\sin(-\theta) = -\sin \theta$$

$$\sec(-\theta) = \sec \theta$$

$$\csc(-\theta) = -\csc \theta$$

$$\cos(-\theta) = \cos \theta$$

$$\tan(-\theta) = -\tan \theta$$

$$\cot(-\theta) = -\cot \theta$$

Example

Use the fundamental trig identities to verify the identity

$$\cos(-\theta) \sec(-\theta) = 1$$

$$\cos\theta \cdot \sec\theta$$

$$\cancel{\cos\theta} \cdot \frac{1}{\cancel{\cos\theta}}$$

$$1 = 1 \quad \checkmark$$

Example

Use the trig identities to transform one side of the equation into the other.

$$\csc(-\theta) \tan(-\theta) = \sec \theta$$

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

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

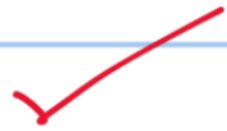
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Example

Use the trig identities to transform one side of the equation into the other.

$$\frac{\sin(-\theta)}{\cos(-\theta)} = -\tan \theta$$

$$\frac{-\sin \theta}{\cos \theta}$$



$$-\tan \theta = -\tan \theta$$

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Example

Use the trig identities to transform one side of the equation into the other.

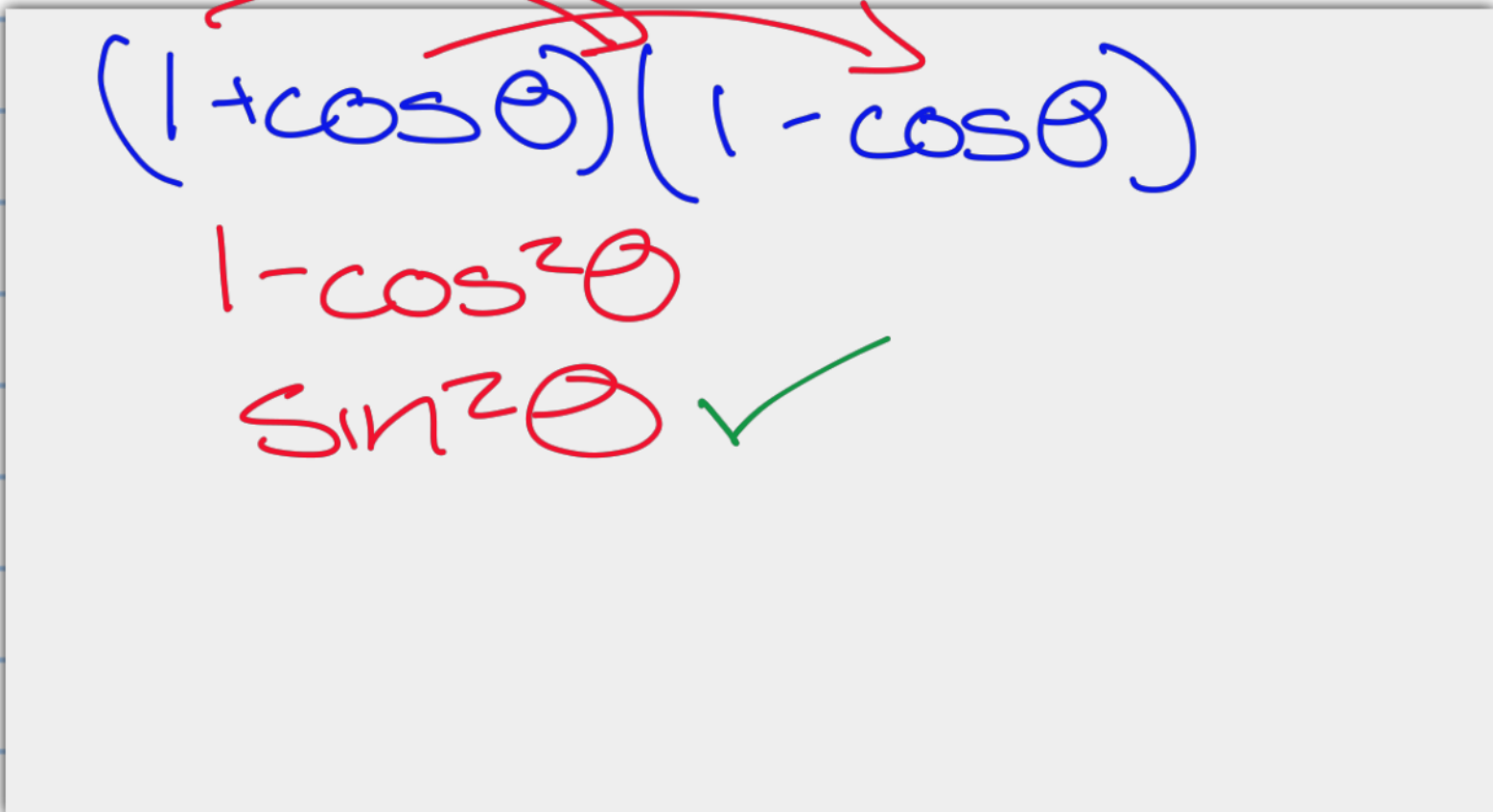
$$\frac{\sin\left(\frac{\pi}{2} - x\right)}{\cos\left(\frac{\pi}{2} - x\right)} = \cot x$$

$$\frac{\cos x}{\sin x} \quad \checkmark$$
$$\cot x = \cot x$$

Example

Use the trig identities to transform one side of the equation into the other.

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



Handwritten work showing the simplification of the equation:

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

The handwritten work shows the original expression $(1 + \cos \theta)(1 - \cos \theta)$ in blue ink. Red arrows point from the $\cos \theta$ terms in both parentheses towards each other, indicating the FOIL method. The next line shows the result of the multiplication, $1 - \cos^2 \theta$, in red ink. The final line shows the identity $\sin^2 \theta$ in red ink, followed by a green checkmark.

Example

Use the trig identities to transform one side of the equation in other.

$$\frac{\cot\left(\frac{\pi}{2} - x\right) + \tan\left(\frac{\pi}{2} - x\right)}{\frac{\sin(-x)}{\cos(-x)}} = -\csc^2 x$$

$$\frac{\tan x + \cot x}{\frac{-\sin x}{\cos x}}$$

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

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

$$\frac{\sin^2 x + \cos^2 x}{\cancel{\cos x} \cancel{\sin x}} \cdot \frac{-\cancel{\cos x}}{\sin x}$$

$$\frac{-1}{\sin^2 x}$$

$$-\csc^2 x$$

Example

Use the fundamental trig to prove the equation.

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

$\frac{1 + \cos x}{\sin x}$ has the conjugate: $1 - \cos x$

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

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

$$= \frac{1 - \cos^2 x}{\sin x(1 - \cos x)}$$

$$= \frac{\sin^2 x}{\sin x(1 - \cos x)}$$

$$= \frac{\sin x}{1 - \cos x}$$