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

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

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

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

$$1 = 1 \checkmark$$

Example

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

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

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

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

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

Example

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

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

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

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

Example

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

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

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

✓

$\cot x = \cot x$

Example

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

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

$(1+\cos\theta)(1-\cos\theta)$

$1-\cos^2\theta$

$\sin^2\theta$ ✓

Example

Use the trig identities to transform one side of the equation i[nto the]
other.

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

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

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

$$\frac{\overbrace{\sin^2 x+\cos^2 x}^{1}}{\cancel{\cos x}\sin x}\cdot-\frac{\cancel{\cos x}}{\sin x}$$

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

$$-\csc^2 x$$

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**

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

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

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

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

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