Section 5.1 & 5.2

Using Trigonometric Identities

part 2

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

Study problems

Trigonometry II Part 2 wks

Algebraic proofs of trigonometric identities

In this lesson, we will look at various strategies for proving identities.
Try to memorize all the different types, as it will make things much simpler for you when they are mixed together.

Type II: Identities with Adding and Subtracting

We will now look at identities where adding & subtracting is involved. You will first convert everything to sine & cosine, then use a common denominator to simplify the fractions.

Multiply the first fraction by the denominator of the second fraction.

Multiply the second fraction by the denominator of the first fraction.

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

Now multiply the fractions together and simplify

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

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

Example 2:

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

Multiply the second fraction by the den

We don't need to do anything with the

will now have the same denominator.

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

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

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

Example

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

$$\cot x + \sec x = \frac{\cos^2 x + \sin x}{\sin x \cos x}$$

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

$\cos^2 x + \sin x$

$\cos x \sin x$

$\frac{\cos^2 x}{\sin x \cos x} + \frac{\sin x}{\sin x \cos x}$

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

$\cot x + \sec x$

Example

Use the fundamental trig identities to verify the equation.

$$\tan\theta + \cot\theta = \csc\theta\sec\theta$$

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

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

$\frac{1}{\sin^2\theta + \cos^2\theta}$

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

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

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

$\csc\theta\sec\theta = \csc\theta\sec\theta$ ✓

$$\cot x + \sin x = \frac{\cos x + \sin^2 x}{\sin x}$$

$$\cot x + \sin x$$

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

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

$$= \frac{\cos x}{\sin x} + \frac{\sin^2 x}{\sin x}$$

$$= \frac{\cos x + \sin^2 x}{\sin x}$$