Lesson Plan 17 Trigonometric Identities II, Math 48C Mitchell Schoenbrun

1) Attendance
2) Hand back Quiz and go over
2) Go over the hand outs.

Review of identities so far

$$\tan(\theta)=\frac{\sin(\theta)}{\cos(\theta)}\ \cot(\theta)=\frac{\cos(\theta)}{\sin(\theta)}\ \sec(\theta)=\frac{1}{\cos(\theta)}\ \csc(\theta)=\frac{1}{\sin(\theta)}$$

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

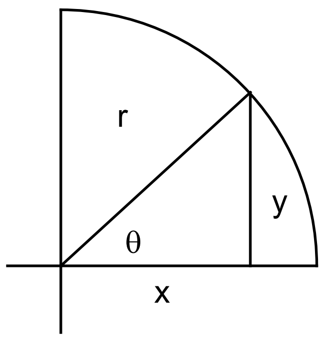
$$\csc(-\theta)=-\csc(\theta)\ \sec(-\theta)=\sec(\theta)\ ctn(-\theta)=-ctn(\theta)$$

$$\sin(\theta)=\cos(90^\circ-\theta)\ \cos(\theta)=\sin(90^\circ-\theta)$$

$$\csc(\theta)=\sec(90^\circ-\theta)\ \sec(\theta)=\csc(90^\circ-\theta)$$

$$\tan(\theta)=ctn(90^\circ-\theta)\ ctn(\theta)=\tan(90^\circ-\theta)$$

Pythagorean Identities



The Pythagorean theorem tells us that $x^2 + y^2 = r^2$

We also know that:

$\sin\theta = \frac{y}{r}$ and $\cos\theta = \frac{x}{r}$

Multiplying each of these by r gives

$y = r\sin\theta$ and $x = r\cos\theta$

Plugging into the first equation we get

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

Dividing through by r^2 gives us

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

Question: We've shown this is true for a triangle in the first quadrant. Why is it also true in the second, third and fourth quadrant. What other value(s) of θ are we missing?

Two very useful versions of this are:

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

From this we get to other useful versions:

$\sin\theta = \pm\sqrt{1-\cos^2\theta}$ and $\cos\theta = \pm\sqrt{1-\sin^2\theta}$

Other Pythagorean Identities:

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

Divide both sides by $\cos^2\theta$ and then by $\sin^2\theta$ to get

$\tan^2\theta + 1 = \sec^2\theta$ and $ctn^2\theta + 1 = \csc^2\theta$

Example:

Solve this equation: $\cos^2\theta + \cos^2\theta\tan^2\theta = 2.6\cos\theta$

Example:

Simplify $\left[1-\cos^2\theta\right]\left[ctn^2\theta\right]$

Example:

Simplify $\left[\sec\theta + \tan\theta\right]\left[\sec\theta - \tan\theta\right]$

Handout some examples to be worked on.