Trigonometric Identities

MCR 3U

What is an identity?

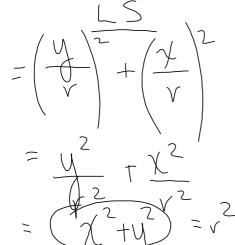
• An identity is a mathematical statement that is true for all variables in the expression that is within its domain.

Minds On!

- Using the unit circle formulas for the trigonometric ratios (i.e., $x, y \ and \ r$) how do we express the trigonometric ratios in terms of
 - x, y and r?
 - $CoS\theta = \frac{x}{x}$
 - tang = 4
- CSCO = Ty SecO = Ty CotA = X

Minds On! Con't...

- Using the formulas that you have made, prove the following... (Sin ())
- a) $\sin^2\theta + \cos^2\theta = 1$



- > Since

$$\frac{RS}{\sqrt{\chi}}$$

$$= \frac{\chi^2}{\chi^2}$$

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

Things to consider... Important!

- There is no direct way to solve trigonometric identities! So what can we do?
 - 1. Change ALL reciprocal ratios into primary ratios immediately.
 - 2. Use $tan\theta = \frac{sin\theta}{cos\theta}$ to simplify. If you use step 1 and 2, you will have expressions that are only in terms of sin and cos (2 trig ratios) as opposed to working with 6 ratios!
 - 3. Factor if possible!
 - 4. Find a common denominator (if applicable).

1. Prove the following trig identity: $\cos^2\theta sec\theta = cot\theta sin\theta$

$$\cos^2\theta sec\theta = \cot\theta sin\theta$$

$$= \cos \theta$$

$$= \cos \theta$$

$$= \cos \theta$$

2. Prove the following trig identity: $tan\beta = \frac{sin\beta + sin^2 \beta}{cos\beta(1 + sin\beta)}$ $= \frac{SIN\beta}{Cos\beta}$ $= \frac{SIN\beta}{Cos\beta}$ $= \frac{Sin\beta(1 + sin\beta)}{Cos\beta(1 + sin\beta)}$ $= \frac{Sin\beta(1 + sin\beta)}{Cos\beta(1 + sin\beta)}$

3. Prove the following trig identity:

$$\sin\theta - \cos\theta = \frac{\sin^4\theta - \cos^4\theta}{\sin\theta + \cos\theta}$$

=sin \(\text{O}\) - \(\omegas\)

$$= \frac{Sin\theta + \cos\theta}{Sin\theta + \cos\theta}$$

4. Prove the following trig identity:
$$\frac{\cos^2 x}{\sin x} + \frac{\sin x}{\sin x} = \csc x$$

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

$$=\frac{1}{\sin\chi}$$

5. Prove the following trig identity:

g identity:
$$|++\alpha n^2 \propto - \sec^2 \propto$$

$$\sin^2 \alpha = \frac{\tan^2 \alpha}{1 + \tan^2 \alpha}$$

NOTE

• You may have to switch around some identities (such as the Pythagorean identity) to prove some trig identities.

 $\sin^2 x + \cos^2 x = 1$ can also be modified as $\sin^2 x = 1 - \cos^2 x$ or $\cos^2 x = 1 - \sin^2 x$.

(050 (1-5in 0) = 0050 (005 0) Homework

• Section 4.6, Page 273-274, #3-9

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