Trig Identities

$\tan\theta = \frac{y}{x} = \frac{\sin\theta}{\cos\theta}$

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

Trig Identity

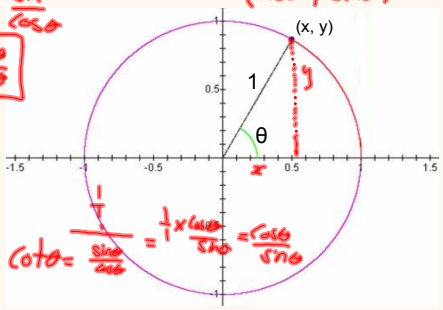
$\csc\theta = \frac{1}{y}$

$\csc\theta = \frac{1}{\sin\theta}$

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

$\cot\theta = \frac{\cos\theta}{\sin\theta} = \frac{1}{\tan\theta}$

$(\cos\theta, \sin\theta)$



$\cot\theta = \frac{1}{\tan\theta} = \frac{1}{1} \times \frac{\cos\theta}{\sin\theta} = \frac{\cos\theta}{\sin\theta}$

Proving Identities

Prove the identity:

$$\tan\theta + \sec\theta = \frac{\sin\theta + 1}{\cos\theta}$$

Proof:

* Convert all tanθ or reciprocal ratios into Sinθ, Cosθ.

$LS = \tan\theta + \sec\theta$

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

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

$= RS$

Proving Identities

Prove the identity:

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

Proof

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

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

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

$= \frac{1}{\sin^2\theta}$

$= \csc^2\theta$

$= RS$

Proving Identities

Prove the identity:

$$\frac{\sin\theta + \sin^2\theta}{(\cos\theta)(1 + \sin\theta)} = \tan\theta$$

Proof:

* Factoring is Good!

$LS = \frac{\sin\theta + \sin^2\theta}{(\cos\theta)(1 + \sin\theta)}$

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

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

$= \tan\theta$

$= RS$

The 5 Key Trig Identities

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

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

$$\csc\theta = \frac{1}{\sin\theta}$$

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

$$\cot\theta = \frac{1}{\tan\theta} = \frac{\cos\theta}{\sin\theta}$$

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

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

Proving Identities

Prove the identity:

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

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

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

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

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

$= \frac{(\cos x)(\cos x)}{\cos x}$

$= \cos x$

Strategies

Some of strategies that might work:

- Convert into sin and cos
- Factor
- Expand
- Find Common Denominators and combine fractions
- Try simplifying both the LS and RS
- Try something different
- Keep trying!

Identities to Prove:

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

$$\frac{1}{\cos\theta} + \tan\theta = \frac{1 + \sin\theta}{\cos\theta}$$

$$\frac{\sin A}{1 - \sin^2 A} = \frac{\tan A}{\cos A}$$

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