Reciprocal Identities

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

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

cosecant secant

$$\sin\frac{2\pi}{3} = \frac{\sqrt{3}}{2}$$

$$\csc\frac{2\pi}{3} = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

Add'l Pythagorean Identities

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

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

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

$$1 + \cot^2\theta = \csc^2\theta$$

$$\cot^2\theta = \csc^2\theta - 1$$

$$1 = \csc^2\theta - \cot^2\theta$$

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

$$\tan^2\theta + 1 = \sec^2\theta$$

$$1 = \sec^2\theta - \tan^2\theta$$

$$\tan^2\theta = \sec^2\theta - 1$$

Using trig identities to prove statements

or solve equations.....

* Start on the most complicated side
* use id s to make substitutions
* look for Pythag (things^2)

Proving Statement: DO NOT SOLVE

DO NOT MOVE THINGS FROM ONE SIDE OF = TO ANOTHER

Ex) SHOW THAT

$$(1+\tan^2 x)(\cos(2x)) = 1-\tan^2 x$$

$$LHS = (1+\tan^2 x)(\cos(2x))$$

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

$$= \cos^2 x - \sin^2 x + \tan^2 x\cos^2 x - \tan^2 x \sin^2 x$$

$$= \cos^2 x \cancel{- \sin^2 x + \frac{\sin^2 x}{\cos^2 x}\left(\frac{\cos^2 x}{1}\right)} - \frac{\sin^2 x}{\cos^2 x}\left(\frac{\sin^2 x}{1}\right)$$

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

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

Ex) $\boxed{\text{Solve}}$ $(\sin x + \cos x)^2 = 0$

$1(\sin^2 x + \cos^2 x) + 2\sin x \cos x = 0$

$1 + 2\sin x \cos x = 0$

$1 + \sin(2x) = 0$

$\sin(2x) = -1$

$2x = 270^\circ$ or $\frac{3\pi}{2}$

$x = 135^\circ$ or $\frac{3\pi}{4}$

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