

Warm Up

Prove the following identities:

$$\frac{1}{\cot x} = \sin x \sec x$$

$$\tan x$$

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

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

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

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

$$\sin^2 \theta$$

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

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

$$\sin^2 \theta$$

Questions from last night's homework?

$$\tan \theta \cos \theta = \sin \theta$$

$$\cot \theta \sec \theta = \csc \theta$$

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

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

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

The diagram illustrates the derivation of the Pythagorean identity $\frac{1}{\cos^2 \theta} = 1 + \tan^2 \theta$. It features a vertical line with two main sections: a white top section and a yellow bottom section.

In the white section, the equation $\frac{\tan^2 \theta}{\sin^2 \theta} = 1 + \tan^2 \theta$ is shown. The term $\frac{\tan^2 \theta}{\sin^2 \theta}$ is highlighted with a blue box, and the term $1 + \tan^2 \theta$ is highlighted with a red box.

In the yellow section, the left side of the equation is simplified to $\frac{\sin^2 \theta}{\cos^2 \theta}$, which is then divided by $\sin^2 \theta$ to yield $\frac{1}{\cos^2 \theta}$.

On the right side of the vertical line, the term $1 + \tan^2 \theta$ is written in red. Below it, the term $\frac{1}{\cos^2 \theta}$ is enclosed in a black rectangular box. Further down, another $\frac{1}{\cos^2 \theta}$ is shown in a black rectangular box, with a red circle drawn around the multiplication dot between the two terms.

$$\textcircled{2} \text{ i) } (\boxed{1-\cos^2\theta}) (\boxed{\sin^2\theta}) = 1$$

$$(\cancel{\sin^2\theta}) \left(\frac{1}{\cancel{\sin^2\theta}} \right)$$

$$\boxed{1}$$

$$\boxed{1}$$

$$\textcircled{j) } \tan\theta + \cot\theta = \boxed{\frac{1}{\sin\theta\cos\theta}}$$

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

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

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

Trig Identities

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

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

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

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

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

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

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

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

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

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

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

Strategies for Proving Identities:

- Work on the most complex side and simplify so it has the same form as the simpler side
- Methods used in simplifying: direct substitution, factoring, finding a common denominator, multiplying by the conjugate

Prove the following identities:

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

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

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

$$\frac{\csc \theta}{\cot^2 \theta} = \tan \theta \sec \theta$$

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

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

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

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

Homework