

# 5.1 Notes

Friday, January 30, 2015  
10:42 AM



## Precalculus

## 5.1 Trig Identities

What is an identity? *a statement that we know is true.*

### Basic Identities

#### Reciprocal Identities

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

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

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

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

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

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

#### Quotient Identities

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

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

#### Pythagorean Identities

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

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

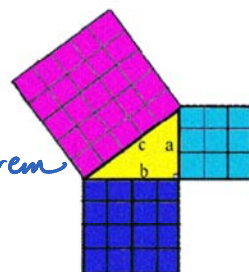
2.  $\tan^2 \theta + 1 = \sec^2 \theta$

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

3.  $1 + \cot^2 \theta = \csc^2 \theta$



Pythagorean Theorem



#### ODD/EVEN Identities

ODD (reflect across origin)

$$\sin(-x) = -\sin x$$

$$\csc(-x) = -\csc x$$

EVEN (reflect across y-axis)

$$\cos(-x) = \cos x$$

$$\sec(-x) = \sec x$$

$$\begin{aligned}\sin(-x) &= -\sin x \\ \csc(-x) &= -\csc x \\ \tan(-x) &= -\tan x \\ \cot(-x) &= -\cot x\end{aligned}$$

$$\begin{aligned}\overline{\cos(-x)} &= \cos x \\ \overline{\sec(-x)} &= \sec x\end{aligned}$$

Examples

Simplify

$$\textcircled{1} \sec x \sin x = \frac{1}{\cos x} \cdot \sin x = \frac{\sin x}{\cos x} = \boxed{\tan x}$$

$$\textcircled{2} \cot x \sin x \sec x = \frac{\cancel{\cos x}}{\cancel{\sin x}} \cdot \sin x \cdot \frac{1}{\cancel{\cos x}} = \boxed{1}$$

$$\textcircled{3} \frac{1 - \sin^2 \theta}{1 + \tan^2 \theta} = \frac{\cos^2 \theta}{\sec^2 \theta} = \frac{\cos^2 \theta}{\frac{1}{\cos^2 \theta}} = \cos^2 \theta \cdot \cos^2 \theta = \cos^4 \theta$$

$$\begin{aligned}\textcircled{4} \frac{\sin x \sin x}{\sin x \cos x} + \frac{\cos x \cos x}{\sin x \cos x} &= \frac{\sin^2 x + \cos^2 x}{\sin x \cos x} = \frac{1}{\sin x \cos x} \\ &= \csc x \sec x\end{aligned}$$

