

Precalculus - Unit 2 Day 0 Simplifying Trig Expressions

you MUST learn the Reciprocal, Ratio, and Pythagorean identities

Directions: simplify each expression

1. $\sin x \cos^2 x - \sin x$
 $\frac{\sin x (\cos^2 x - 1)}{\sin x (-\sin^2 x)} = -\sin^3 x$

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

5. $\frac{\tan^2 x + 1}{1 + \cot^2 x} = \frac{\sec^2 x}{\csc^2 x} = \frac{\frac{1}{\cos^2 x}}{\frac{1}{\sin^2 x}}$
 $\frac{1}{\cos^2 x} \cdot \frac{\sin^2 x}{1} = \frac{\sin^2 x}{\cos^2 x} = \tan^2 x$

2. $\frac{\sec \theta}{\csc \theta} = \frac{\frac{1}{\cos \theta}}{\frac{1}{\sin \theta}} = \frac{1}{\cos \theta} \cdot \frac{\sin \theta}{1} = \frac{\sin \theta}{\cos \theta} = \tan \theta$

6. $\cot x (\tan x + \cot x)$
 $\cot x \tan x + \cot^2 x = 1 + \cot^2 x = \csc^2 x$

3. $\csc x - \cos x \cot x$
 $\frac{1}{\sin x} - \cos x \left(\frac{\cos x}{\sin x} \right) = \frac{1}{\sin x} - \frac{\cos^2 x}{\sin x} = \frac{1 - \cos^2 x}{\sin x} = \frac{1 - (1 - \sin^2 x)}{\sin x} = \frac{\sin^2 x}{\sin x} = \sin x$

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

7. $\sin x \tan x - \csc x \tan x$
 $\sin x \left(\frac{\sin x}{\cos x} \right) - \frac{1}{\sin x} \left(\frac{\sin x}{\cos x} \right) = \frac{\sin^2 x}{\cos x} - \frac{1}{\cos x} = \frac{\sin^2 x - 1}{\cos x} = \frac{-\cos^2 x}{\cos x} = -\cos x$

4. $\sec^2 x - \tan x - 3$
 $\tan^2 x + 1 - \tan x - 3 = \tan^2 x - \tan x - 2$
 $x^2 - x - 2 = (x - 2)(x + 1)$
 $(\tan x - 2)(\tan x + 1)$

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

8. $\frac{\tan x + \cot x}{\cot x}$
 $\frac{\tan x}{\cot x} + \frac{\cot x}{\cot x} = \frac{\tan x}{\frac{1}{\tan x}} + 1 = \tan x \cdot \tan x + 1 = \tan^2 x + 1 = \sec^2 x$