Fundamental Trigonometric Identities

Cofunction Identities

$\sin\theta = \cos(\frac{\pi}{2} - \theta)$ $\cos\theta = \sin(\frac{\pi}{2} - \theta)$

$\tan\theta = \cot(\frac{\pi}{2} - \theta)$ $\cot\theta = \tan(\frac{\pi}{2} - \theta)$

$\sec\theta = \csc(\frac{\pi}{2} - \theta)$ $\csc\theta = \sec(\frac{\pi}{2} - \theta)$

Reciprocal Identities

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

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

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

Quotient Identities

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

Pythagorean Identities

$\sin^2\theta + \cos^2\theta = 1$ $1 + \tan^2\theta = \sec^2\theta$ $1 + \cot^2\theta = \csc^2\theta$

Even/Odd Identities

$\sin(-\theta) = -\sin(\theta)$ $\cos(-\theta) = \cos(\theta)$ $\tan(-\theta) = -\tan(\theta)$

$\csc(-\theta) = -\csc(\theta)$ $\sec(-\theta) = \sec(\theta)$ $\cot(-\theta) = -\cot(\theta)$

Sine, cosecant, tangent and cotangent are odd functions. Cosine and secant are even functions.

Example 1: Use identities to find the exact value of the remaining trigonometric functions, if possible.

a. $\sin x = \frac{1}{2}$ and $\cos x > 0$

b. $\csc\vartheta = -5$ and $\cos x < 0$

We are now going to use identities to simplify trigonometric expressions.

Tip: Write trig functions in terms of sine and/or cosine before simplifying, when possible.

Example 2: Simplify $\csc\theta\tan\theta$

Example 3: Simplify $\csc t - \cos t \cot t$

Example 4: Simplify $\frac{1-\sin^2 x}{\cot x}$

Try This! **Simplify each of the following.**

A) $\cot x \sec x$

B) $\sec x (\cos x - \cos^3 x)$

Homework: **Page 377 #11-15 odd, 21, 37-52 all**