

## Fundamental Trigonometric Identities

### Cofunction Identities

$$\begin{array}{ll} \sin \theta = \cos\left(\frac{\pi}{2} - \theta\right) & \cos \theta = \sin\left(\frac{\pi}{2} - \theta\right) \\ \tan \theta = \cot\left(\frac{\pi}{2} - \theta\right) & \cot \theta = \tan\left(\frac{\pi}{2} - \theta\right) \\ \sec \theta = \csc\left(\frac{\pi}{2} - \theta\right) & \csc \theta = \sec\left(\frac{\pi}{2} - \theta\right) \end{array}$$

### Reciprocal Identities

$$\begin{array}{ll} \sin \theta = \frac{1}{\csc \theta} & \csc \theta = \frac{1}{\sin \theta} \\ \cos \theta = \frac{1}{\sec \theta} & \sec \theta = \frac{1}{\cos \theta} \\ \tan \theta = \frac{1}{\cot \theta} & \cot \theta = \frac{1}{\tan \theta} \end{array}$$

### Quotient Identities

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

### Pythagorean Identities

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

### Even/Odd Identities

$$\begin{array}{lll} \sin(-\theta) = -\sin(\theta) & \cos(-\theta) = \cos(\theta) & \tan(-\theta) = -\tan(\theta) \\ \csc(-\theta) = -\csc(\theta) & \sec(-\theta) = \sec(\theta) & \cot(-\theta) = -\cot(\theta) \end{array}$$

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

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**Example 1:** Factor the expression and then use identities to simplify.

a.  $\cos x \sin^2 x - \cos x$

b.  $\cos^2 x \csc x - \csc x$

**Example 2:** Factor.

a.  $1 - \cos^2 x$

b.  $2 \csc^2 x - 7 \csc x + 6$

**Tip:** Write each expression in terms of one trig function before factoring.

c.  $\sec^2 x + 3 \tan x + 1$

d.  $\cos^2 x - \frac{2}{\sec x} + 1$

**Homework:** Page 377-378 #31-35 odd, 53 – 69 odd, 71, and 73