


**GO COUGARS!** 

### Homework Questions

11.  $\tan \theta = 2, \sin \theta < 0$   
 12.  $\sec \theta = -3, \tan \theta < 0$   
 13.  $\theta$  is undefined,  $\sin \theta = 0$   
 14.  $\tan \theta$  is undefined,  $\sin \theta > 0$

In Exercises 15-20, match the trigonometric expression with one of the following.

(a)  $\sec x$  (b)  $-1$  (c)  $\cot x$   
 (d)  $1$  (e)  $-\tan x$  (f)  $\sin x$

15.  $\sec^2 x \cos x$  16.  $\tan x \csc x$   
 17.  $\sec^2 x - \csc^2 x$  18.  $(1 - \cos^2 x) \csc x$

In Exercises 21-26, match the trigonometric expression with one of the following.

(a)  $\csc x$  (b)  $\tan x$  (c)  $\sin^2 x$   
 (d)  $\sin x \tan x$  (e)  $\sec^2 x$  (f)  $\sec^2 x + \tan^2 x$   
 21.  $\sin x \csc x$  22.  $\cos^2 x (\sec^2 x - 1)$   
 23.  $\sec^2 x - \tan^2 x$  24.  $\cot x \sec x$   
 25.  $\frac{\sec^2 x - 1}{\sin^2 x}$  26.  $\frac{\cos^2(\pi/2) - x}{\cos x}$

In Exercises 27-38, use the fundamental identities to simplify the expression. Use the table feature of a graphing utility to check your result numerically.

27.  $\cot x \sin x$  28.  $\cos \beta \tan \beta$   
 29.  $\sin \phi (\csc \phi - \sin \phi)$  30.  $\sec^2 \alpha (1 - \sin^2 \alpha)$   
 31.  $\csc x$  32.  $\frac{\sec \theta}{\csc \theta}$   
 33.  $\cot x$  34.  $\frac{\tan^2 \theta}{\sec^2 \theta}$   
 35.  $\csc \alpha = \frac{\sin \alpha}{\tan \alpha}$

In Exercises 31-60, factor the expression and use the fundamental identities to simplify. Use a graphing utility to check your result graphically.

31.  $\sec^2 x - \csc^2 x \cos^2 x$  52.  $\sec^2 x \tan^2 x + \sec^2 x$   
 53.  $\frac{\cos^2 x - 1}{\cos x - 1}$  54.  $\frac{\csc^2 x - 1}{\csc x - 1}$   
 55.  $\tan^2 x + 2 \tan^2 x + 1$  56.  $1 - 2 \sin^2 x + \sin^4 x$   
 57.  $\sin^2 x - \cos^2 x$   
 58.  $\sec^2 x - \tan^2 x$   
 59.  $\sec^2 x \csc^2 x - \csc^2 x$   
 60.  $\sec^2 x - \sec^2 x - \sec x + 1$

In Exercises 61-68, perform the indicated operation and use the fundamental identities to simplify.

61.  $(\sin x + \cos x)^2$   
 62.  $(\tan x + \sec x)(\tan x - \sec x)$   
 63.  $(\csc x + 1)(\csc x - 1)$   
 64.  $(5 - 5 \sin x)(5 + 5 \sin x)$   
 65.  $\frac{1}{1 + \cos x} + \frac{1}{1 - \cos x}$   
 66.  $\frac{1}{\sec x + 1} - \frac{1}{\sec x - 1}$

67.  $\frac{\sec^2 x}{\tan x}$   
 68.  $\frac{\tan^2 x - \sec^2 x}{\tan x}$

**Handwritten Notes:**

- $\sin \theta = 0$  at  $(-\pi, 0)$  and  $(\pi, 0)$ .  $\pi \frac{\sin \pi}{\cos \pi} = 0$
- $1 + \cot^2 x = \csc^2 x$
- $\cot^2 x - \csc^2 x = -1$
- $\sin \phi (\frac{1}{\sin \phi} - \sin \phi)$
- $\frac{1 - \sin^2 \phi}{\cos^2 \phi}$
- $\sec \alpha \sin \alpha \cot \alpha = 1$
- $\frac{1}{\cos \alpha} \frac{\sin \alpha}{1} \frac{\cos \alpha}{\sin \alpha}$
- $a^2 + 2a^2 + 1 = (a^2 + 1)^2$
- $a^2 - a^2 b^2 = a^2(1 - b^2)$
- $(\tan^2 x + 1)(\tan^2 x + 1) = \sec^2 x \sec^2 x = \tan^2 x + 1$
- $\frac{\cos^2 x (1 - \cos^2 x)}{\sin^2 x} = \frac{\cos^2 x \sin^2 x}{\sin^2 x} = \cos^2 x$
- $\csc^2 x (\csc x - 1) - 1 (\csc x - 1)$
- $(\csc^2 x - 1)(\csc x - 1)$
- $\cot^2 x (\csc x - 1)$
- $\tan^2 x - \sec^2 x = \frac{-1}{\tan^2 x} = -\cot^2 x$

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## 5.2 Verifying Trig Identities

To make one side of the equation to look like the other.

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To Verify a Trig Identity you may work with one side of the equation only!!

Rules/Suggestions/Look For

1.  $\sec y \cos y = 1$

LHS  $\frac{1}{\cos y} \cdot \frac{\cos y}{1} = 1 \checkmark$

reciprocals

2.  $\frac{\sin^2 x}{\tan^2 x} = \cos^2 x$

LHS  $\frac{\sin^2 x \cot^2 x}{\frac{\sin^2 x \cos^2 x}{\sin^2 x}} = \cos^2 x \checkmark$

reciprocal  
quotient identity

3.  $\cos^2 x - \sin^2 x = 2\cos^2 x - 1$

LHS  $\cos^2 x - (1 - \cos^2 x) = \cos^2 x - 1 + \cos^2 x = 2\cos^2 x - 1 \checkmark$

Pythagorean Identity

$\sin^2 x + \cos^2 x = 1$   
 $\sin^2 x = 1 - \cos^2 x$

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4.  $(\sec \theta - \tan \theta)(\csc \theta + 1) = \cot \theta$

LHS  $\left(\frac{1}{\cos \theta} - \frac{\sin \theta}{\cos \theta}\right) \left(\frac{1}{\sin \theta} + 1\right)$   
 $\rightarrow \left(\frac{1 - \sin \theta}{\cos \theta}\right) \left(\frac{1 + \sin \theta}{\sin \theta}\right)$

in terms sin/cos  
common denom  
foiled

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

P.I

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

cancel

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

$\cot \theta = \cot \theta \checkmark$

rewrite

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$$5. \frac{1 + \cos \theta}{\sin \theta} + \frac{\sin \theta}{1 + \cos \theta} = 2 \csc \theta$$

$$\text{LHS } \frac{(1 + \cos \theta)(1 + \cos \theta) + \sin \theta (\sin \theta)}{\sin \theta (1 + \cos \theta)}$$

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

$$\frac{2 + 2\cos \theta}{\sin \theta (1 + \cos \theta)}$$

$$\frac{2(1 + \cos \theta)}{\sin \theta (1 + \cos \theta)}$$

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

$$2 \csc \theta$$

$$= 2 \csc \theta \quad \checkmark$$

common denom

foil

identity

factor

cancel

reciprocal

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$$6. \frac{\sin \beta}{1 - \cos \beta} = \frac{1 + \cos \beta}{\sin \beta}$$

$$\frac{1 + \cos \beta}{1 + \cos \beta} \cdot \frac{\sin \beta}{1 - \cos \beta}$$

$$\frac{(1 + \cos \beta) \sin \beta}{1 - \cos^2 \beta}$$

$$\frac{(1 + \cos \beta) \cancel{\sin \beta}}{\cancel{\sin \beta}}$$

$$\frac{1 + \cos \beta}{\sin \beta} \quad \checkmark$$

mult by conjugate  
of denominator

foil

P.I

cancel

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# HOMework



p 365

1-9 odd, 39-45 odd, 48

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