GO COUGARS!

p 387 **Homework Questions**

In Exercises 1–38, verify the identity.

1. $\sin t \csc t = 1$
3. $(1 + \sin\alpha)(1 - \sin\alpha) = \cos^2\alpha$
5. $\cos^2\beta - \sin^2\beta = 1 - 2\sin^2\beta$
7. $\sin^2\alpha - \sin^4\alpha = \cos^2\alpha - \cos^4\alpha$
9. $\dfrac{\csc^2\theta}{\cot\theta} = \csc\theta\sec\theta$
11. $\dfrac{\cot^2 t}{\csc t} = \csc t - \sin t$
13. $\sin^{1/2}x\cos x - \sin^{5/2}x\cos x = \cos^3 x\sqrt{\sin x}$
15. $\dfrac{1}{\sec x\tan x} = \csc x - \sin x$
17. $\csc x - \sin x = \cos x\cot x$
19. $\dfrac{1}{\tan x} + \dfrac{1}{\cot x} = \tan x + \cot x$
21. $\dfrac{\cos\theta\cot\theta}{1 - \sin\theta} - 1 = \csc\theta$
23. $\dfrac{1}{\sin x + 1} + \dfrac{1}{\csc x + 1} = 1$
25. $\tan\left(\dfrac{\pi}{2} - \theta\right)\tan\theta = 1$
27. $\dfrac{\csc(-x)}{\sec(-x)} = -\cot x$
29. $\dfrac{\tan x\cot x}{\cos x} = \sec x$
31. $\dfrac{\tan x + \cot y}{\tan x\cot y} = \tan y + \cot x$
33. $\sqrt{\dfrac{1 + \sin\theta}{1 - \sin\theta}} = \dfrac{1 + \sin\theta}{|\cos\theta|}$
35. $\cos^2\beta + \cos^2\left(\dfrac{\pi}{2} - \beta\right) = 1$
37. $\sin t\csc\left(\dfrac{\pi}{2} - t\right) = \tan t$

In Exercises 39–46, (a) use a graphing utility to graph each side of the equation to determine whether the equation is an identity, (b) use the *table* feature of a graphing utility to determine whether the equation is an identity, and (c) confirm the results of parts (a) and (b) algebraically.

39. $2\sec^2 x - 2\sec^2 x\sin^2 x - \sin^2 x - \cos^2 x = 1$
43. $\csc^4 x - 2\csc^2 x + 1 = \cot^4 x$

In Exercises 51–54, use the cofunction identities to evaluate the expression without the aid of a calculator.

51. $\sin^2 25° + \sin^2 65°$
53. $\cos^2 20° + \cos^2 52° + \cos^2 38° + \cos^2 70°$

Feb 2-9:51 PM

5.3 Solving Trigonometric Equations

algebraically

graphically

multi-angle

Feb 13-7:19 PM

$$\sin x - \sqrt{2} = -\sin x$$

$-\sin x \qquad -\sin x$

$-\sqrt{2} = -2\sin x$

$\frac{-\sqrt{2}}{-2} = \frac{-2\sin x}{-2}$

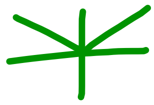
$\frac{\sqrt{2}}{2} = \sin x$

$\frac{1}{\sqrt{2}} = \sin x$

RA $\frac{\pi}{4}$ Q I II

$x = \frac{\pi}{4}, \frac{3\pi}{4}$ $[0, 2\pi)$

if D $(-\infty, \infty)$



$x = \frac{\pi}{4} + 2k\pi, \frac{3\pi}{4} + 2k\pi$

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$$4\sin^2 x - 3 = 0$$

$4\sin^2 x = 3$

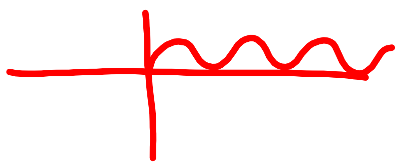
$\sin^2 x = \frac{3}{4}$

$\sin x = \pm\frac{\sqrt{3}}{2}$

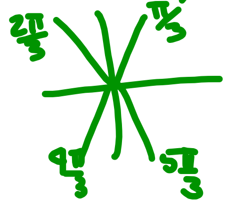
RA $\frac{\pi}{3}$ all quad

$x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

$\pi \qquad \pi$



D $(-\infty, \infty)$ $\frac{\pi}{3} + k\pi, \frac{2\pi}{3} + k\pi$



Feb 17-1:21 PM

$$\sin^2 x = 2\sin x$$

$\sin^2 x - 2\sin x = 0$

$\sin x(\sin x - 2) = 0$

$\sin x = 0$	$\sin x = 2$
$x = 0, \pi$	$x =$ no solution

$(-\infty, \infty)$

$k\pi$, k is an integer

Feb 17-1:21 PM

$$2\sin^2 x - 3\sin x + 1 = 0$$

$2y^2 - 3y + 1 = 0$

$y = \sin x$

$(2y - 1)(y - 1) = 0$

$(2\sin x - 1)(\sin x - 1) = 0$

$\sin x = \frac{1}{2}$	$\sin x = 1$
$x = \frac{\pi}{6}, \frac{5\pi}{6}$	$x = \frac{\pi}{2}$

$x = \frac{\pi}{6} + 2k\pi,\ \frac{5\pi}{6} + 2k\pi,\ \frac{\pi}{2} + 2k\pi$ $(-\infty, \infty)$

Feb 17-1:21 PM

$$3\sec^2 x - 2\tan^2 x - 4 = 0$$

$3(\tan^2 x + 1) - 2\tan^2 x - 4 = 0$

$3\tan^2 x + 3 - 2\tan^2 x - 4 = 0$

$\tan^2 x - 1 = 0$

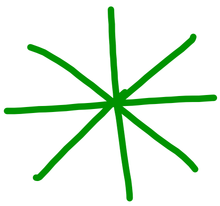
$\tan^2 x = 1$

$\tan x = \pm 1$

$x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

$(-\infty, \infty)$

$x = \frac{\pi}{4} + \frac{k\pi}{2}$



Feb 17-1:21 PM

$$2\cos 3x - 1 = 0$$

$[0, 2\pi)$

$\cos 3x = \frac{1}{2}$

RA $\frac{\pi}{3}$

$\frac{3x}{3} = \left(\underbrace{\frac{\pi}{3}, \frac{5\pi}{3}}_{1} \; +2\pi \; \underbrace{\frac{7\pi}{3}, \frac{11\pi}{3}}_{2} \; +2\pi \; \underbrace{\frac{13\pi}{3}, \frac{17\pi}{3}}_{3}\right)\frac{1}{3}$

$x = \frac{\pi}{9}, \frac{5\pi}{9}, \frac{7\pi}{9}, \frac{11\pi}{9}, \frac{13\pi}{9}, \frac{17\pi}{9}$

Feb 17-1:21 PM

$$\tan\frac{x}{2} - 1 = 0$$

$[0, 2\pi)$

$\tan\frac{x}{2} = 1$

$2\left(\frac{x}{2} = \frac{\pi}{4}, \frac{5\pi}{4}\right)2$

$x = \frac{2\pi}{4}, \frac{10\pi}{4}$

$= \frac{\pi}{2}, \cancel{\frac{5\pi}{2}}$ outside of domain

Feb 17-1:21 PM

HOMEWORK

p 396 5-39 odd, 47, 57

Feb 2-9:51 PM

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p 379 Homework Questions

In Exercises 27–44, use the fundamental identities to simplify the expression. There is more than one correct form of each answer.

37. $\cos\left(\frac{\pi}{2} - x\right)\sec x$

39. $\frac{\cos^2 y}{1 - \sin y}$

In Exercises 61–64, perform the addition or subtraction and use the fundamental identities to simplify. There is more than one correct form of each answer.

61. $\frac{1}{1 + \cos x} + \frac{1}{1 - \cos x}$

63. $\frac{\cos x}{1 + \sin x} + \frac{1 + \sin x}{\cos x}$

In Exercises 65–68, rewrite the expression so that it is not in fractional form. There is more than one correct form of each answer.

65. $\frac{\sin^2 y}{1 - \cos y}$

67. $\frac{3}{\sec x - \tan x}$

In Exercises 73–76, use a graphing utility to determine which of the six trigonometric functions is equal to the expression. Verify your answer algebraically.

73. $\cos x \cot x + \sin x$

75. $\frac{1}{\sin x}\left(\frac{1}{\cos x} - \cos x\right)$

In Exercises 77–82, use the trigonometric substitution to write the algebraic expression as a trigonometric function of θ, where $0 < \theta < \pi/2$.

79. $\sqrt{x^2 - 9}$, $x = 3 \sec \theta$

81. $\sqrt{x^2 + 25}$, $x = 5 \tan \theta$

In Exercises 91–94, rewrite the expression as a single logarithm and simplify the result.

91. $\ln|\cos x| - \ln|\sin x|$

93. $\ln|\cot t| + \ln(1 + \tan^2 t)$

Feb 2-9:51 PM