Monday, February 26, 2018
5:51 PM

KEY

Sections 5.2, 5.3 Review Exercises, #25, 29, 33 - 49 odd
Show all work on a SEPARATE sheet of paper

5.2 **In Exercises 25–32, verify the identity.**

25. $\cos x(\tan^2 x + 1) = \sec x$

26. $\sec^2 x \cot x - \cot x = \tan x$

27. $\cos\left(x + \frac{\pi}{2}\right) = -\sin x$

28. $\cot\left(\frac{\pi}{2} - x\right) = \tan x$

29. $\frac{1}{\tan \theta \csc \theta} = \cos \theta$

30. $\frac{1}{\tan x \csc x \sin x} = \cot x$

31. $\sin^5 x \cos^2 x = (\cos^2 x - 2\cos^4 x + \cos^6 x)\sin x$

32. $\cos^3 x \sin^2 x = (\sin^2 x - \sin^4 x)\cos x$

5.3 **In Exercises 33–38, solve the equation.**

33. $\sin x = \sqrt{3} - \sin x$

34. $4\cos \theta = 1 + 2\cos \theta$

35. $3\sqrt{3}\tan u = 3$

36. $\frac{1}{2}\sec x - 1 = 0$

37. $3\csc^2 x = 4$

38. $4\tan^2 u - 1 = \tan^2 u$

In Exercises 39–46, find all solutions of the equation in the interval $[0, 2\pi)$.

39. $2\cos^2 x - \cos x = 1$

40. $2\sin^2 x - 3\sin x = -1$

41. $\cos^2 x + \sin x = 1$

42. $\sin^2 x + 2\cos x = 2$

43. $2\sin 2x - \sqrt{2} = 0$

44. $\sqrt{3}\tan 3x = 0$

45. $\cos 4x(\cos x - 1) = 0$

46. $3\csc^2 5x = -4$

In Exercises 47–50, use inverse functions where needed to find all solutions of the equation in the interval $[0, 2\pi)$.

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

48. $2\cos^2 x + 3\cos x = 0$

49. $\tan^2 \theta + \tan \theta - 12 = 0$

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5.2 In Exercises 25–32, verify the identity.

25. $\cos x(\tan^2 x + 1) = \sec x$

$\cos x(\sec^2 x) =$

$\cos x\left(\frac{1}{\cos^2 x}\right) =$

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

$\sec x$ ✓

29. $\frac{1}{\tan\theta \csc\theta} = \cos\theta$

$\frac{1}{\tan\theta} \cdot \frac{1}{\csc\theta} =$

$\frac{1}{\frac{\sin\theta}{\cos\theta}} \cdot \frac{1}{\frac{1}{\sin\theta}} =$

$1 \cdot \frac{\cos\theta}{\cancel{\sin\theta}} \cdot \cancel{1} \cdot \frac{\cancel{\sin\theta}}{\cancel{1}} = \cos\theta$ ✓

5.3 In Exercises 33–38, solve the equation.

33. $\sin x = \sqrt{3} - \sin x$

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

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

S | A
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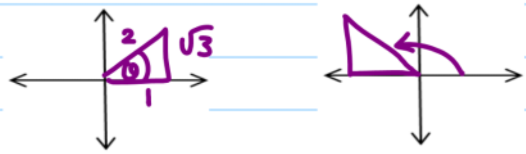


$\boxed{x = \frac{\pi}{3} + 2\pi n}$ $\boxed{x = \frac{2\pi}{3} + 2\pi n}$

35. $3\sqrt{3}\tan u = 3$

$\tan u = \frac{3}{3\sqrt{3}}$

$\tan u = \frac{1}{\sqrt{3}}$

S | A
T | C

* $\boxed{u = \frac{\pi}{6} + \pi n}$ $\boxed{u = \frac{7\pi}{6} + \pi n}$

* you can combine both answers to $\frac{\pi}{6} + \pi n$ because if you add $\frac{\pi}{6} + \frac{6\pi}{6}$ you get $\frac{7\pi}{6}$.

37. $3\csc^2 x = 4$

$\sqrt{\csc^2 x} = \sqrt{\frac{4}{3}}$

$\frac{h}{o}$ $\csc x = \pm \frac{2}{\sqrt{3}}$

* $\boxed{x = \frac{\pi}{3} + 2\pi n \quad \frac{2\pi}{3} + 2\pi n \quad \frac{4\pi}{3} + 2\pi n \quad \frac{5\pi}{3} + 2\pi n}$

* these can be combined as: $x = \frac{\pi}{3} + \pi n$ and $\frac{2\pi}{3} + \pi n$

In Exercises 39–46, find all solutions of the equation in the interval $[0, 2\pi)$.

39. $2\cos^2 x - \cos x = 1$

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

$(2\cos x + 1)(\cos x - 1) = 0$

$2x^2 - x - 1 = 0$

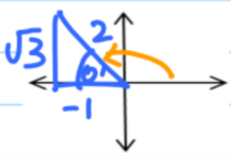
$(2x+1)(x-1) = 0$

$2\cos x + 1 = 0$

$2\cos x = -1$

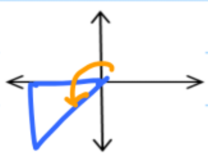
$\cos x = -\frac{1}{2}$

S | A
T | C



$\theta' = \frac{\pi}{3}$

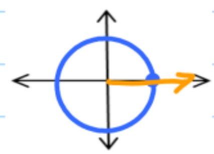
$\boxed{x = \frac{2\pi}{3}}$



$\boxed{x = \frac{4\pi}{3}}$

$\cos x - 1 = 0$

$\cos x = 1$



$\boxed{x = 0}$

41. $\cos^2 x + \sin x = 1$

* Pythag ID

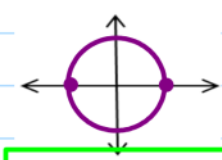
$1 - \sin^2 x + \sin x = 1$

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

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

$-\sin x = 0$

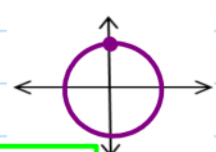
$\sin x = 0$



$\boxed{x = 0, x = \pi}$

$\sin x - 1 = 0$

$\sin x = 1$



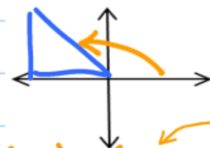
$\boxed{x = \frac{\pi}{2}}$

43. $2\sin 2x - \sqrt{2} = 0$

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

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

$\sin 2x = \frac{1}{\sqrt{2}}$ S A / T C



$\frac{1}{2}(2x) = \left(\frac{\pi}{4} + 2\pi n\right)\frac{1}{2}$ $\frac{1}{2}(2x) = \left(\frac{3\pi}{4} + 2\pi n\right)\frac{1}{2}$

* $x = \frac{\pi}{8} + \pi n$ * $x = \frac{3\pi}{8} + \pi n$

* general solutions

All solutions in the interval $[0, 2\pi)$:

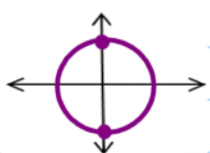
$\boxed{\frac{\pi}{8}, \frac{9\pi}{8}, \frac{3\pi}{8}, \frac{11\pi}{8}}$

" $\frac{\pi}{8} + \frac{8\pi}{8}$ " $\frac{3\pi}{8} + \frac{8\pi}{8}$

* ADD π TO get other solutions up to 2π

45. $\cos 4x(\cos x - 1) = 0$

$\cos 4x = 0$



$\frac{1}{4}(4x) = \left(\frac{\pi}{2} + 2\pi n\right)\frac{1}{4}$

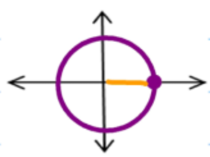
* $x = \frac{\pi}{8} + \frac{\pi}{2}n$

$\frac{1}{4}(4x) = \left(\frac{3\pi}{2} + 2\pi n\right)\frac{1}{4}$

* $x = \frac{3\pi}{8} + \frac{\pi}{2}n$

$\cos x - 1 = 0$

$\cos x = 1$



* $x = 0 + 2\pi n$

* general solutions

All solutions in the interval $[0, 2\pi)$:

$\frac{\pi}{2} \cdot \frac{4}{4} = \frac{4\pi}{8}$

$\boxed{0, \frac{\pi}{8}, \frac{5\pi}{8}, \frac{9\pi}{8}, \frac{13\pi}{8}, \frac{3\pi}{8}, \frac{7\pi}{8}, \frac{11\pi}{8}, \frac{15\pi}{8}}$

Keep adding $\frac{4\pi}{8}$ to $\frac{\pi}{8}$ until you get all solutions up to 2π

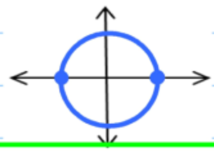
Keep adding $\frac{4\pi}{8}$ to $\frac{3\pi}{8}$ until you get all solutions up to 2π.

In Exercises 47–50, use inverse functions where needed to find all solutions of the equation in the interval $[0, 2\pi)$.

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

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

$\sin x = 0$



$\boxed{x = 0,\ x = \pi}$

$\sin x - 2 = 0$

$\sin x = 2$

$\sin^{-1}(2) = x$ ← Domain error

$\boxed{\text{no solution}}$

* 2 is not in the range of $\sin x$

49. $\tan^2 \theta + \tan \theta - 12 = 0$

$x^2 + x - 12 = 0$

$(x+4)(x-3) = 0$

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

$\tan x + 4 = 0$

$\tan x = -4$ ← neg

S | A
T | C

$\tan^{-1}(-4) = x$

$x = -1.3258$

$\pi - 1.3258$

$\boxed{x = 1.8158}$

$\theta' = 1.3258$

$2\pi - 1.3258$

$\boxed{x = 4.9574}$

$\tan x - 3 = 0$

$\tan x = 3$ ← pos

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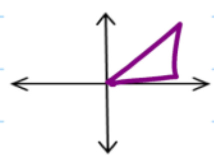
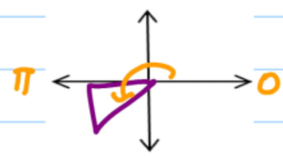
$\tan^{-1}(3) = x$

$x = 1.2490$



$\boxed{x = 1.2490}$



$\pi + 1.2490$

$\boxed{x = 4.3906}$

* Equivalent to text answer

$\theta = \arctan(-4) + n\pi \qquad \theta = \arctan 3 + n\pi$

$\theta = \arctan(-4) + \pi,\ \arctan(-4) + 2\pi,\ \arctan 3,\ \arctan 3 + \pi$