1. –/1 points LarTrig9 2.3.001. My Notes Ask Your Teach

Fill in the blank.

When solving a trigonometric equation, the preliminary goal is to ---Select--- the trigonometric function involved in the equation.

isolate

2. –/1 points LarTrig9 2.3.002. My Notes Ask Your Teache

Fill in the blank.

The equation $2 \sin \theta + 1 = 0$ has the solution $\theta = \frac{7\pi}{6} + 2n\pi$ and $\theta = \frac{11\pi}{6} + 2n\pi$, which are called ---Select--- solutions.

General.

The "n" is unspecified

3. –/1 points LarTrig9 2.3.003. My Notes Ask Your Teache

Fill in the blank. $2u^2 - 3u + 1$

The equation $2 \tan^2 x - 3 \tan x + 1 = 0$ is a trigonometric equation that is of [ ] type.

Quadratic (in "tan x")

4. –/1 points LarTrig9 2.3.004. My Notes Ask

Fill in the blank.

A solution of an equation that does not satisfy the original equation is called a(n) ---Select--- solution.

extraneous

$A = B \Rightarrow A^2 = B^2$ But $A^2 = B^2 \not\Rightarrow A = B$

$(3)^2 = (-3)^2$ But $3 \neq -3$!

Squaring both sides good technique for capturing solutions in a big net, but the net captures fish that need to be thrown back. Checking answers is important.

Tests, use time wisely.

Checking less important.

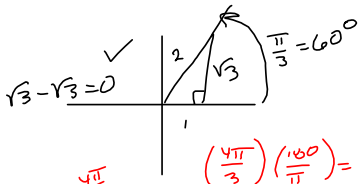
5. **–/2 points** LarTrig9 2.3.005.

Verify that the x-values are solutions of the equation.

$$\tan x - \sqrt{3} = 0$$

(a) $x = \frac{\pi}{3}$ (b) $x = \frac{4\pi}{3}$

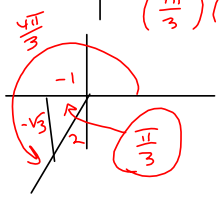
$\tan\left(\frac{\pi}{3}\right) - \sqrt{3} = \sqrt{3} - \sqrt{3} = 0$ ✓



$\tan\left(\frac{4\pi}{3}\right) - \sqrt{3}$

$= \sqrt{3} - \sqrt{3} = 0$ ✓

$\left(\frac{4\pi}{3}\right)\left(\frac{180}{\pi}\right) = 240$



7. **–/2 points** LarTrig9 2.3.007.

Verify that the x-values are solutions of the equation.

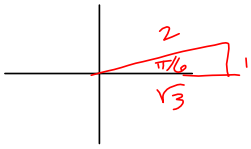
$$3\tan^2(2x) - 1 = 0$$

(a) $x = \frac{\pi}{12}$ (b) $x = \frac{5\pi}{12}$

$3\tan^2\left(2\left(\frac{\pi}{12}\right)\right) - 1 =$

$= 3\tan^2\left(\frac{\pi}{6}\right) - 1$

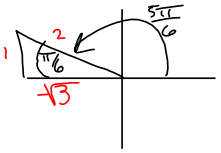
$3\left(\frac{1}{\sqrt{3}}\right)^2 - 1 = 3\left(\frac{1}{3}\right) - 1 = 0$



$3\tan^2\left(2\left(\frac{5\pi}{12}\right)\right) - 1$

$= 3\tan^2\left(\frac{5\pi}{6}\right) - 1 = 3\left(-\frac{1}{\sqrt{3}}\right)^2 - 1$

$= 3\left(\frac{1}{3}\right) - 1 = 0$ ✓



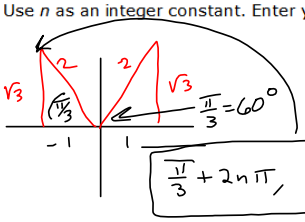
8. –/1 points LarTrig9 2.3.011. My Notes Ask Your Teach

Solve the equation. (Enter your answers as a comma-separated list. Use n as an integer constant. Enter your response in radians.)

$\sqrt{3}\csc x - 2 = 0$

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

$\csc x = \frac{2}{\sqrt{3}}$ i.e., $\sin x = \frac{\sqrt{3}}{2}$



$\pi - \frac{\pi}{3} = \frac{3\pi-\pi}{3} = \frac{2\pi}{3} = 120^\circ$

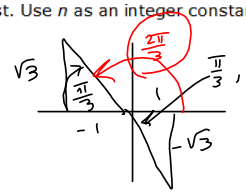
$\frac{\pi}{3} + 2n\pi$, $\frac{2\pi}{3} + 2n\pi$ $(n \in \mathbb{Z})$

9. –/1 points LarTrig9 2.3.012.MI. My Notes Ask Your Teach

Solve the equation. (Enter your answers as a comma-separated list. Use n as an integer constant. Enter your response in radians.)

$\tan x + \sqrt{3} = 0$

$\Rightarrow \tan x = -\sqrt{3}$



$\frac{\pi}{3}$, so $-\frac{\pi}{3}$ & $\frac{2\pi}{3}$ for the other

Always safe. Not as elegant

$2\frac{\pi}{3} + 2n\pi$

$-\frac{\pi}{3} + 2n\pi$

Because the 2 terminal sides are π radians apart;

$2\frac{\pi}{3} + n\pi$, $n \in \mathbb{Z}$

OR you could say

$-\frac{\pi}{3} + n\pi$ ...

$2\pi + \frac{2\pi}{3}$

$\frac{8\pi}{3} + n\pi$, $n \in \mathbb{Z}$ also works!

11. –/1 points LarTrig9 2.3.015. My Notes Ask Your Teach

Solve the equation. (Enter your answers as a comma-separated list. Use n as an integer constant. Enter your response in radians.)

$9\sec^2 x - 12 = 0$

Quadratic in secant. RECALL:

$\sqrt{3^2} = \sqrt{9} = 3$

$\sqrt{(-3)^2} = \sqrt{9} = 3$

so $\sqrt{x^2}$ is $|x|$

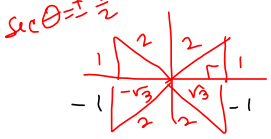
$9\sec^2 x = 12$

$\sec^2 x = \frac{12}{9} = \frac{4}{3}$

$\sec x = \pm\sqrt{\frac{4}{3}} = \pm\frac{\sqrt{4}}{\sqrt{3}} = \pm\frac{2}{\sqrt{3}}$

$\sec\theta = \pm\frac{\sqrt{3}}{2}$

so, $\cos x = \pm\frac{\sqrt{3}}{2}$



Ref angle is $\frac{\pi}{6} = 30^\circ$

Jump to

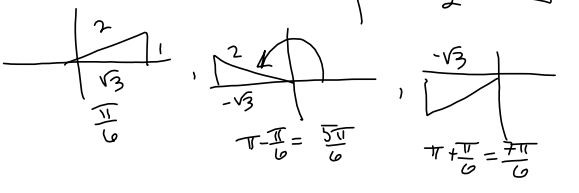
$x^2 = B$

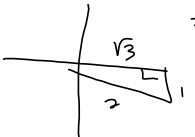
$\sqrt{x^2} = \sqrt{B}$

$|x| = \sqrt{B}$

$x = \sqrt{B}$ OR $x = -\sqrt{B}$

$x = \pm\sqrt{B}$





Digital

$\frac{\pi}{6} + 2n\pi$

$\frac{5\pi}{6} + 2n\pi$

$\frac{7\pi}{6} + 2n\pi$

$\frac{11\pi}{6} + 2n\pi$

Elegant

$\frac{\pi}{6} + n\pi$ $\forall n \in \mathbb{Z}$

$\frac{5\pi}{6} + n\pi$

12. –/1 points LarTrig9 2.3.016. My Notes Ask Your Teach

Solve the equation. (Enter your answers as a comma-separated list. Use n as an integer constant. Enter your response in radians.)

$3\cot^2 x - 1 = 0$

$3\cot^2 x = 1$

$\cot^2 x = \frac{1}{3}$

$\cot x = \pm\sqrt{\frac{1}{3}} = \pm\frac{1}{\sqrt{3}}$

or $\tan x = \pm\sqrt{3}$, to "see" it better

$\tan\theta = \sqrt{3}$: $\frac{\pi}{3}, \frac{4\pi}{3}$

$\tan\theta = -\sqrt{3}$: $\frac{\pi}{3}$'s, $\frac{2\pi}{3}, \frac{5\pi}{3}$

OK: $\frac{\pi}{3}+2n\pi, \frac{4\pi}{3}+2n\pi, \frac{2\pi}{3}+2n\pi, \frac{5\pi}{3}+2n\pi$

OR: $\frac{\pi}{3}+n\pi, n\in\mathbb{Z}$; $\frac{2\pi}{3}+n\pi, n\in\mathbb{Z}$

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

1st

Refined

STYLIN'

13. –/1 points LarTrig9 2.3.018. My Notes Ask Your Teach

Solve the equation. (Enter your answers as a comma-separated list. Use n as an integer constant. Enter your response in radians.)

$\sin^2 x = 3\cos^2 x$

M1: Turn $\cos^2 x$ into $1-\sin^2 x$

$\sin^2 x = 3(1-\sin^2 x)$

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

$4\sin^2 x = 3$

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

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

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

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

M2: Divide both sides by $\cos^2 x$

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

$\tan^2 x = 3$

$\tan x = \pm\sqrt{3}$

$x^2 + 5x = 0$

$x^2 = -5x$

$x = -5$ gives one soln, but loses one.

$\tan x = \sqrt{3}$: slick $\frac{\pi}{3}+n\pi, n\in\mathbb{Z}$; $\frac{\pi}{3}+2n\pi, n\in\mathbb{Z}$; $\frac{4\pi}{3}+2n\pi, n\in\mathbb{Z}$ → work-man-like

$\tan x = -\sqrt{3}$: $\frac{2\pi}{3}+2n\pi$, $\frac{5\pi}{3}+2n\pi$

$\frac{\pi}{3}+n\pi, \frac{2\pi}{3}+n\pi$, $n\in\mathbb{Z}$

14. –/1 points LarTrig9 2.3.021. My Notes Ask Your Teach

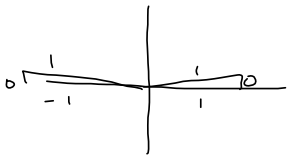
Solve the equation. (Enter your answers as a comma-separated list. Use n as an integer constant. Enter your response in radians.)

$\tan 8x(\tan x - 1) = 0$

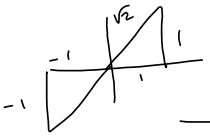
$(\tan(8x))(\tan(x) - 1) = 0$

$AB = 0 \Rightarrow$ $A = 0$ OR $B = 0$

$\tan(8x) = 0$ OR $\tan x - 1 = 0$



$\tan x = 1$



$\Rightarrow 8x = n\pi, n \in \mathbb{Z}$

$x = \frac{n\pi}{8}, n \in \mathbb{Z}$

$\frac{\pi}{4} + 2n\pi$, $\frac{5\pi}{4} + 2n\pi$, i.e. $\frac{\pi}{4} + n\pi, n \in \mathbb{Z}$

16. –/1 points LarTrig9 2.3.024. My Notes Ask Your Teach

Solve the equation. (Enter your answers as a comma-separated list. Use n as an integer constant. Enter your response in radians.)

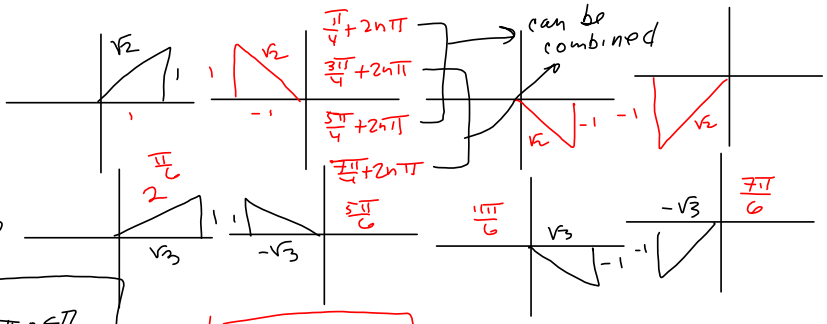
$$(2\sin^2 x - 1)(3\tan^2 x - 1) = 0$$

$2\sin^2 x - 1 = 0$ OR $3\tan^2 x = 1$

$2\sin^2 x = 1$ $\tan^2 x = \frac{1}{3}$

$\sin^2 x = \frac{1}{2}$ $\tan x = \pm\frac{1}{\sqrt{3}}$

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



$\frac{\pi}{4} + 2n\pi$, $n \in \mathbb{Z}$

$\frac{3\pi}{4} + 2n\pi$, $n \in \mathbb{Z}$

$\frac{5\pi}{4} + 2n\pi$, $n \in \mathbb{Z}$

$\frac{7\pi}{4} + 2n\pi$, $n \in \mathbb{Z}$

OR just $\frac{\pi}{4} + n\pi$, $n \in \mathbb{Z}$ or $\frac{3\pi}{4} + n\pi$, $n \in \mathbb{Z}$

$\frac{\pi}{6} + n\pi$

$\frac{5\pi}{6} + n\pi$

$\frac{\pi}{6} + 2n\pi$

$\frac{5\pi}{6} + 2n\pi$

$\frac{7\pi}{6} + 2n\pi$

$\frac{11\pi}{6} + 2n\pi$

17. –/1 points LarTrig9 2.3.025. My Notes Ask Your

Find all solutions of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list. If there is no solution, enter NO SOLUTION.)

$$9\cos^3 x = 9\cos x$$

$\cos^3 x = \cos x$

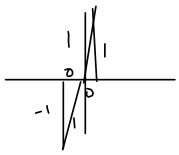
$\frac{\cos^3 x}{\cos x} = 1$ is true, but has lost some solutions.

Not a good method.

$\cos^3 x - \cos x = 0$

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

$\cos(x) = 0$ OR $\cos^2(x) = 1$



$\cos^2 x = 1$

$\cos x = \pm 1$

$\frac{\pi}{2} + 2n\pi$

$\frac{3\pi}{2} + 2n\pi$

$\frac{\pi}{2} + n\pi$, $n \in \mathbb{Z}$

or $2n\pi$, $n \in \mathbb{Z}$

$\pi + 2n\pi$, $n \in \mathbb{Z}$

$n\pi$, $n \in \mathbb{Z}$

$\cos^3 x = \cos x$

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

$\cos^2 x = 1$

$\cos x = \pm 1$

captures only the $n\pi, n \in \mathbb{Z}$ part, missing the $\frac{\pi}{2} + n\pi, n \in \mathbb{Z}$ part.

19. –/1 points LarTrig9 2.3.028.MI. My Notes Ask Your T

Find all solutions of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list. If there is no solution, enter NO SOLUTION.)

$10 \sin^2 x = 10 + 5 \cos x$

$\Rightarrow 2\sin^2 x = 2 + \cos x$

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

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

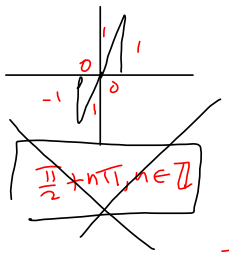
$-2\cos^2 x - \cos x = 0$

$2\cos^2 x + \cos x = 0$

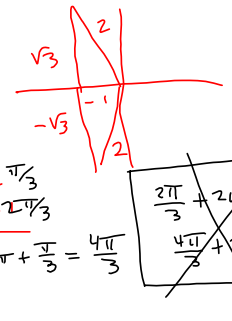
$(\cos x)(2\cos x + 1) = 0$

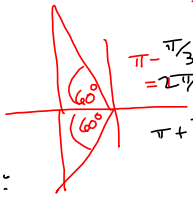
$\cos x = 0$ OR $2\cos x + 1 = 0$

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



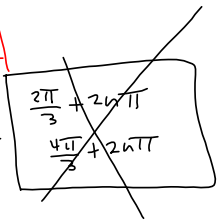
$\frac{\pi}{2} + n\pi, n \in \mathbb{Z}$





$\pi - \frac{\pi}{3} = \frac{2\pi}{3}$

$\pi + \frac{\pi}{3} = \frac{4\pi}{3}$



$\frac{2\pi}{3} + 2n\pi$

$\frac{4\pi}{3} + 2n\pi$

No. Only want $x \in [0, 2\pi)$:

$x \in \left\{\frac{\pi}{2}, \frac{3\pi}{2}, \frac{2\pi}{3}, \frac{4\pi}{3}\right\}$ = solution set.

20. –/1 points LarTrig9 2.3.031. My Notes Ask Your T

Find all solutions of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list. If there is no solution, enter NO SOLUTION.)

$4 \sin x + \csc x = 0$

$4\sin x + \frac{1}{\sin x} = 0$

$\left(\frac{4\sin x}{1}\right)\left(\frac{\sin x}{\sin x}\right) + \frac{1}{\sin x} = 0$

$\frac{4\sin^2 x + 1}{\sin x} = 0$

$4\sin x = -\csc x$

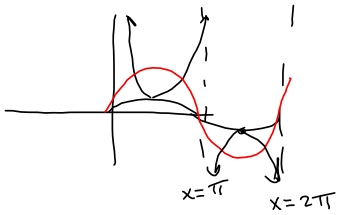
$\frac{4\sin x}{-\csc x} = 1$

$-4\sin^2 x = 1$

$4\sin^2 x + 1 = 0$

$4\sin^2 x = -1$

$\sin^2 x = -\frac{1}{4}$ No Real solns!



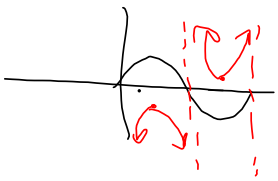
$x = \pi$ $x = 2\pi$

Oh!

$4\sin x + \csc x = 0$

$4\sin x = -\csc x$

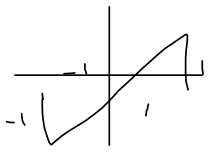
is impossible!



21. –/1 points LarTrig9 2.3.032. My Notes Ask Your

Find all solutions of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list. If there is no solution, enter NO SOLUTION.)

$\sin x - 2 = \cos x - 2$



$\sin x = \cos x$

$\sin x - \cos x = 0$

Doesn't Help

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

Dividing both sides by $\cos x$ did work!

generally a skeptic...

22. –/1 points LarTrig9 2.3.033. My Notes Ask Your T

Find all solutions of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list. If there is no solution, enter NO SOLUTION.)

$4\cos^2 x + 2\cos x - 2 = 0$

$4u^2 + 2u - 2 = 0$

$2u^2 + u - 1 = 0$

$(2u - 1)(u + 1)$

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

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

$2\pi - \frac{\pi}{3} = \frac{5\pi}{3}$

$\frac{\pi}{3}, \frac{5\pi}{3}$ π

$x \in \{\frac{\pi}{3}, \pi, \frac{5\pi}{3}\}$

23. –/1 points LarTrig9 2.3.035. My Notes Ask Your

Find all solutions of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list. If there is no solution, enter NO SOLUTION.)

$8\sec^2 x + 4\tan^2 x - 12 = 0$

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

$\tan^2 x + 1 = \sec^2 x$

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

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

$3\tan^2 x - 1 = 0$

$\tan^2 x = \frac{1}{3}$

$\tan x = \pm\frac{1}{\sqrt{3}}$

$\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$

for $\tan x = +\frac{1}{\sqrt{3}}$ $\frac{\pi}{6}$

$\tan x = -\frac{1}{\sqrt{3}}$

24. –/1 points LarTrig9 2.3.036. My Notes Ask Your

Find all solutions of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list. If there is no solution, enter NO SOLUTION.)

$3\cos x + 3\sin x \tan x = 6$

$\cos x + \frac{\sin x \sin x}{\cos x} = 2$

$\frac{\cos^2 x + \sin^2 x}{\cos x} = \frac{1}{\cos x} = \sec x = 2$

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

$\frac{\pi}{3}, \frac{5\pi}{3}$

$360 - 60 = 300$

$(300)(\frac{\pi}{180})$

$= \frac{10\pi}{6} = \frac{5\pi}{3}$

25. –/1 points LarTrig9 2.3.037. My Notes Ask Your T

Find all solutions of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list. If there is no solution, enter NO SOLUTION.)

$\csc x + \cot x = \frac{\sqrt{3}}{3} \Rightarrow \frac{1}{\sin x} + \frac{\cos x}{\sin x} = \frac{\frac{\sqrt{3}}{3}\sin x}{\sin x} \Rightarrow 1 + \cos x = \frac{\sqrt{3}}{3}\sin x = \frac{1}{\sqrt{3}}\sin x$

$1 + 2\cos x + \cos^2 x = \frac{1}{3}\sin^2 x$

$\cos^2 x + 2\cos x + 1 = \frac{1}{3}(1 - \cos^2 x)$

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

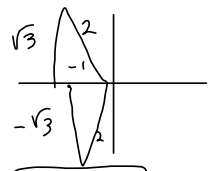
$\frac{4}{3}\cos^2 x + 2\cos x + \frac{2}{3} = 0$

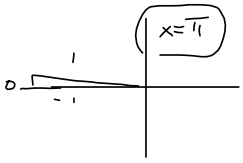
$4\cos^2 x + 6\cos x + 2 = 0$

$2\cos^2 x + 3\cos x + 1 = 0$

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

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





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

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

CHECK: $\csc\frac{2\pi}{3} + \cot\frac{2\pi}{3} = \frac{2}{\sqrt{3}} + \frac{-1}{\sqrt{3}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ ✓

$\csc\frac{4\pi}{3} + \cot\frac{4\pi}{3} = -\frac{2}{\sqrt{3}} + +\frac{1}{\sqrt{3}} = \frac{-2}{\sqrt{3}} = \frac{-2\sqrt{3}}{3}$ NO

$\csc\pi + \cot\pi =$ ∄

26. –/1 points LarTrig9 2.3.039. My Notes Ask Your Te

Solve the multiple-angle equation. (Enter your answers as a comma-separated list. Use n as an integer constant. Enter your response in radians.)

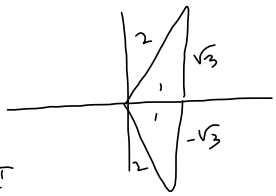
$2 \cos 4x - 1 = 0$

$2\cos(4x) = 1$

$\cos(4x) = \frac{1}{2}$

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

$x = \frac{\pi}{12}$



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

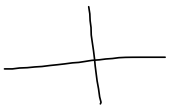
$x = \frac{5\pi}{12}$

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

$x = \frac{\pi}{12} + \frac{n\pi}{2}$

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

$x = \frac{5\pi}{12} + \frac{n\pi}{2}$



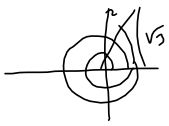
$\frac{\pi}{12} + \frac{\pi}{2} = \frac{\pi + 6\pi}{12} = \frac{7\pi}{12}$

$2\cos\left(4\left(\frac{7\pi}{12}\right)\right) - 1$

$= 2\cos\left(\frac{7\pi}{3}\right) - 1 = 2\left(\frac{1}{2}\right) - 1 = 0$ ✓

$\frac{\pi}{12} + \frac{2\pi}{2} = \frac{\pi}{12} + \frac{12\pi}{12} = \frac{13\pi}{12}$

$2\cos\left(4\left(\frac{13\pi}{12}\right)\right) - 1 = 2\cos\left(\frac{13\pi}{3}\right) - 1$



27. –/1 points LarTrig9 2.3.040. My Notes Ask Your Te

Solve the multiple-angle equation. (Enter your answers as a comma-separated list. Use n as an integer constant. Enter your response in radians.)

$2 \sin 2x + \sqrt{3} = 0$

Same idea as #26.

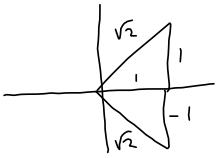
28. –/1 points LarTrig9 2.3.043. My Notes Ask Your Tea

Solve the multiple-angle equation. (Enter your answers as a comma-separated list. Use n as an integer constant. Enter your response in radians.)

$2\cos\frac{x}{3} - \sqrt{2} = 0$

$2\cos\left(\frac{x}{3}\right) = \sqrt{2}$

$\cos\left(\frac{x}{3}\right) = \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$



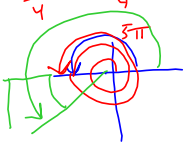
$\frac{\pi}{4} + 2n\pi = \frac{x}{3} \Rightarrow x = \frac{3\pi}{4} + 6n\pi$

$\frac{7\pi}{4} + 2n\pi = \frac{x}{3} \Rightarrow x = \frac{21\pi}{4} + 6n\pi$

$= \frac{5\pi}{4} + 6n\pi$

$\frac{21\pi}{4} = \frac{20\pi}{4} + \frac{\pi}{4} = 5\pi + \frac{\pi}{4}$

5 is odd multiple so it's coterminal with π.



29. –/1 points LarTrig9 2.3.045. My Notes Ask Yo

Find the x-intercepts of the graph. (Enter your answers as a comma-separated list. Use n as an integer constant.)

$y = \sin\frac{\pi x}{8} + 1 \overset{\text{SET}}{=} 0$

$\Rightarrow \sin\left(\frac{\pi x}{8}\right) = -1$

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

$x = \frac{24\pi}{2\pi} + \frac{16n\pi}{\pi} = 12 + 16n, \quad n \in \mathbb{Z}.$

30. –/1 points LarTrig9 2.3.047. My Notes Ask Yo

Find the x-intercepts of the graph. (Enter your answers as a comma-separated list. Use n as an integer constant.)

$y = \tan^2\left(\frac{\pi x}{6}\right) - 3 \overset{SET}{=} 0$

$\tan^2\left(\frac{\pi x}{6}\right) = 3$

$\sqrt{\tan^2\left(\frac{\pi x}{6}\right)} = \sqrt{3}$

$\left|\tan\left(\frac{\pi x}{6}\right)\right| = \sqrt{3}$

$\tan\left(\frac{\pi x}{6}\right) = \pm\sqrt{3}$

$\frac{\pi}{3}$ OR 60° reference angles.

$\frac{\pi x}{6} = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

$\frac{\pi x}{6} = \frac{\pi}{3} + 2\pi n$

$x = 2, 4, 8, 10$

$x = 2 + 12n$

$(2\pi n)\left(\frac{6}{\pi}\right) = 12n$

$x = 2+12n, 4+12n, 8+12n, 10+12n, n \in \mathbb{Z}$

31. –/1 points LarTrig9 2.3.048. My Notes Ask Yo

Find the x-intercepts of the graph. (Enter your answers as a comma-separated list. Use n as an integer constant.)

$y = \sec^4\left(\frac{\pi x}{32}\right) - 4 \overset{SET}{=} 0$

$\sec^4\left(\frac{\pi x}{32}\right) = 4$

$\sqrt[4]{\sec^4\left(\frac{\pi x}{32}\right)} = \sqrt[4]{4} = \sqrt{2}$

$\left|\sec\left(\frac{\pi x}{32}\right)\right| = \sqrt{2}$

$\sec\left(\frac{\pi x}{32}\right) = \pm\sqrt{2}$

$\cos\left(\frac{\pi x}{32}\right) = \pm\frac{1}{\sqrt{2}}$

$4 = 2^2 = \left(\sqrt{2}\right)^2 = \left(\sqrt{2}\right)^4$

$\frac{\pi x}{32} = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4} + 2n\pi$

$x = 8 + 64n, \forall n \in \mathbb{Z}$

$x = 24 + 64n, \ldots$

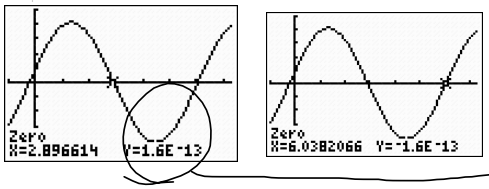
$x = 40 + 64n, \ldots$

$x = 64 + 64n, \ldots$

32. –/1 points LarTrig9 2.3.049. My Notes Ask Your Teac

Use a graphing utility to approximate the solutions (to three decimal places) of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list.)

$4 \sin x + \cos x = 0$



$x \approx 2.897, 6.038$

$y = 1.6 \times 10^{-13}$

$= .0000000000000016 \approx 0$

33. –/1 points LarTrig9 2.3.051. My Notes Ask Your Teac

Use a graphing utility to approximate the solutions (to three decimal places) of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list.)

$$\frac{1 + \sin x}{\cos x} + \frac{\cos x}{1 + \sin x} = 8$$

Ask if you want help on this one. Same moves as the previous. Not really much new trig skill involved, here. Not something we test over, either. Tests are all about paper and pencil!

34. –/1 points LarTrig9 2.3.052. My Notes Ask Your Teach

Use a graphing utility to approximate the solutions (to three decimal places) of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list.)

$$\frac{3\cos x \cot x}{3 - 3\sin x} = 3$$

$$\frac{3\cos x \cot x}{3(1-\sin x)} = 3$$

$$\frac{\cos x \cot x}{1-\sin x} = 3$$

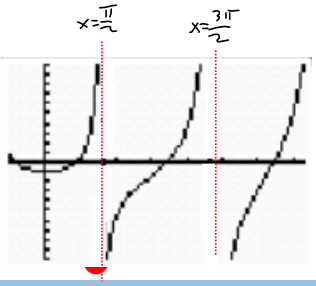
Ask, if help needed.

35. –/1 points LarTrig9 2.3.053. My Notes Ask Your Teach

Use a graphing utility to approximate the solutions (to three decimal places) of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list.)

$$4x \tan x - 4 = 0$$

$$x \tan x - 1 = 0$$



6. –/1 points LarTrig9 2.3.055. My Notes Ask Your Teac

Use a graphing utility to approximate the solutions (to three decimal places) of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list.)

$$\sec^2 x + 0.4 \tan x - 1 = 0$$

Another one you might ask about or play around with.

37. –/1 points LarTrig9 2.3.059. My Notes Ask Your Teache

Use the Quadratic Formula to solve the equation in the interval $[0, 2\pi)$. Then use a graphing utility to approximate the angle x. (Enter your answers as a comma-separated list. Round each answer to four decimal places.)

$15 \sin^2 x - 17 \sin x + 4 = 0$

Let $u = \sin x$. Then

$15u^2 - 17u + 4 = 0$

$\Rightarrow 15u^2 - 17u + 4 = 0$

$a = 15,\ b = -17,\ c = 4$

$b^2 - 4ac$ = discriminant

$= (-17)^2 - 4(15)(4) = 289 - 240 = 49$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

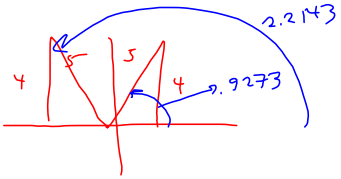
$= \frac{17 \pm \sqrt{49}}{30}$

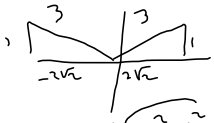
$\frac{17+7}{30} = \frac{24}{30} = \frac{4}{5}$

$\frac{17-7}{30} = \frac{1}{3}$

$u = \frac{1}{3}$ or $u = \frac{4}{5}$

$\sin x = \frac{1}{3}$ or $\sin x = \frac{4}{5}$





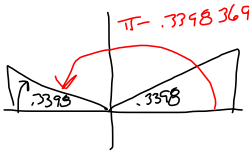
$\sqrt{3^2 - 1^2} = \sqrt{8} = 2\sqrt{2}$

$\Rightarrow x \approx .3398$ radians,

```
sin⁻¹(4/5)
        .927295218
Ans-π
       -2.214297436
```

```
        3.665191429
11π/6
        5.759586532
sin⁻¹(1/3)
        .3398369095
Ans-π
       -2.801755744
```

$\pi - .3398369095 \approx 2.8018$



$x \in \{.3398, 2.8018, .9273, 2.2143\}$

38. –/1 points LarTrig9 2.3.060. My Notes Ask Your Tea

Use the Quadratic Formula to solve the equation in the interval $[0, 2\pi)$. Then use a graphing utility to approximate the an x. (Enter your answers as a comma-separated list. Round each answer to four decimal places.)

$3 \tan^2 x + 12 \tan x - 36 = 0$

Same as #37, Ask if you have questions.

39. –/1 points LarTrig9 2.3.072. My Notes Ask Your T

Use inverse functions where needed to find all solutions of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list.)

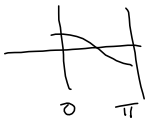
$\sec^2 x + 4 \sec x - 12 = 0$

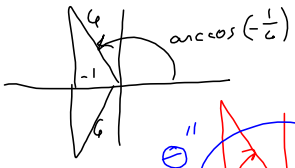
$u^2 + 4u - 12 = (u+6)(u-2) = 0$

$u = -6$ $\quad u = 2$

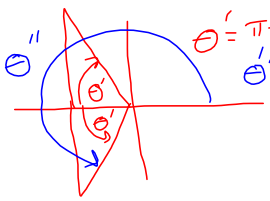
$\sec x = -6$ $\quad \sec x = 2$

When in doubt, go back to restriction on cosine to see what arccosine func. (arccos(x), $\cos^{-1}(x)$)





$\frac{\pi}{3}, \frac{5\pi}{3}$

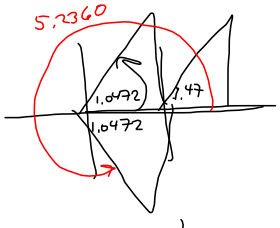


$\theta' = \pi - \arccos(-\frac{1}{6})$ = ref. angle.

$\theta'' = \pi + \theta' = 2\pi - \arccos(-\frac{1}{6})$

```
cos⁻¹(1/2)
        1.047197551
2π-1.047197551
        5.235987756
```

$x \approx 1.0472, 5.2360$




```
        .927295218
Ans-π
       -2.214297436
cos⁻¹(-1/6)
        1.738244406
Ans-2π
       -4.544940901
```

≈ 1.7382

≈ -4.5449 has opposite sign from what we want

Should be π – previous, but calculator won't do it as slick as ans – 2π

40. –/1 points LarTrig9 2.3.074. My Notes Ask Your Tea

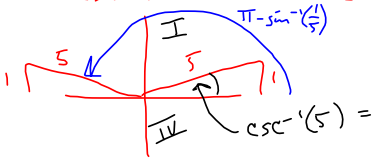
Use inverse functions where needed to find all solutions of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list.)

$$\csc^2 x - 5 \csc x = 0$$

$\csc(x)(\csc(x)-5)=0$

$\csc x = 0$ Nevah!

$\csc(x)=5 \Rightarrow \sin(x)=\frac{1}{5}$




```
      1.047197551
2π-1.047197551
      5.235987756
sin⁻¹(1/5)
      .2013579208
Ans-π
     -2.940234733
```

Should be "+" b/c π-ans is what we want ans-π is calculator-easy.

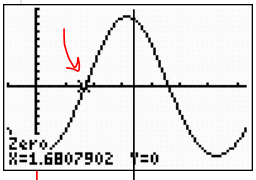
$x \approx .2014, 2.9402$

41. –/1 points LarTrig9 2.3.076. My Notes Ask Your Te

Use a graphing utility to approximate the solutions (to three decimal places) of the equation in the given interval. (Enter your answers as a comma-separated list.)

$$\cos^2 x - 9 \cos x - 1 = 0, \quad [0, \pi]$$

Different domain, this time.



$x=0$ $x=\pi$

$x \approx 1.6808$

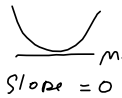
42. –/13 points LarTrig9 2.3.080.

Consider the following.

Function	Trigonometric Equation
$f(x) = \cos^2 x - \sin x$	$-2 \sin x \cos x - \cos x = 0$

(a) Use a graphing utility to graph the function.

The "derived" function from f(x). Also called the derivative of f(x), written f'(x). It gives the slope of the curve, f(x).



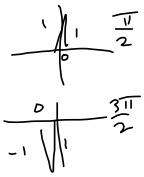
Slope = 0

(b) Solve the trigonometric equation and demonstrate that its solutions are the x-coordinates of the maximum and minimum points of f. (Calculus is required to find the trigonometric equation. For each solution, give an exact answer and then round to four decimal places. Enter your answers from smallest to largest.)

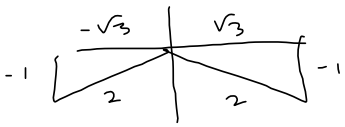
$-2\sin x \cos x - \cos x = 0$

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

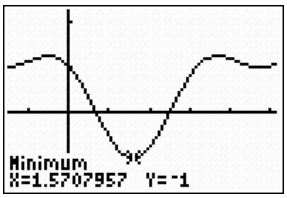
$\cos x = 0$



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



$x = \frac{7\pi}{6}, \frac{11\pi}{6}$



Located the min @ $(\frac{\pi}{2}, -1)$

$\frac{\pi}{2} + 2n\pi$ $\left.\right\}$ $\frac{\pi}{2} + n\pi$

$\frac{3\pi}{2} + 2n\pi$

$1.5708 + 2\pi$

$4.7124 + 2\pi$

$\frac{7\pi}{6} + 2n\pi$

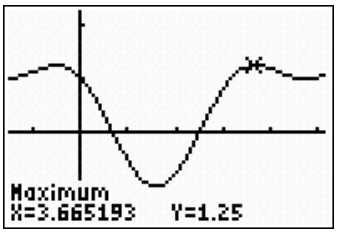
$\frac{11\pi}{6} + 2n\pi$

3.6652

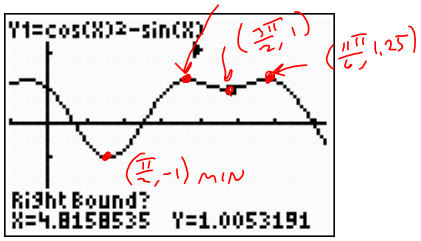
5.7596

$\frac{\pi}{2}, \frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$ in order

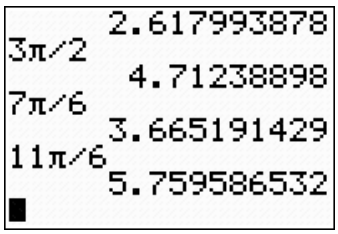
$\frac{\pi}{2} \approx 1.5708$



≈ 3.6652



$(\frac{7\pi}{6}, 1.25)$ $(\frac{3\pi}{2}, 1)$ $(\frac{11\pi}{6}, 1.25)$ $(\frac{\pi}{2}, -1)$ MIN



45. –/1 points LarTrig9 2.3.086.

Use the graph to approximate the number of points of intersection of the graphs of y_1 and y_2.

$y_1 = 4 \sin x$

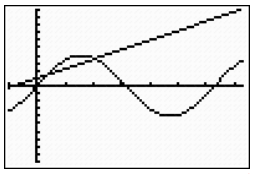
$y_2 = \frac{5}{4}x + 1$

OR graph $y = Y_1 - Y_2$ & look for x-intercepts! (Subtraction Method.

5/4*X+1 is OK on calculator, but in person? Nevp.

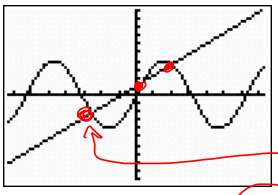
$\frac{5}{4}X$, (5/4)X are OK

5/4X is NOT ACCEPTABLE



How many OUTside the pic? ?

Can see 2, here, but suggestion of more, off to the left.



Bigger window shows a 3rd intersection

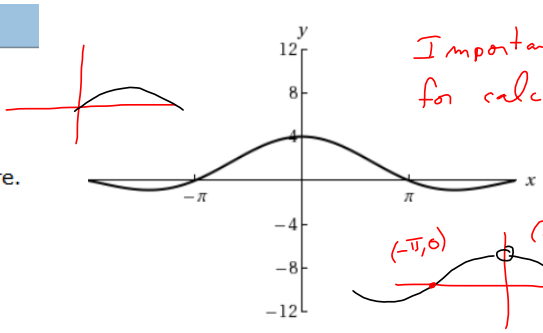
3

46. –/7 points LarTrig9 2.3.087.

Consider the function

$$f(x) = \frac{4 \sin x}{x}$$

and its graph shown in the figure.



Important function(s) for calculus.

(−π, 0) (0, 4) (HOLE) (π, 0)

(a) What is the domain of the function? (Enter your answer using interval notation.)

(b) Identify any symmetry of the graph.

(a) $\mathbb{R} \setminus \{0\} = (-\infty, 0) \cup (0, \infty)$

$\sin x$ is odd $f(-x) = -f(x)$

x is odd

$\frac{4 \sin x}{x} = \frac{-}{-} = + \Rightarrow f(-x) = +f(x)$ is even.

Symmetry about y-axis.

Identify any asymptotes of the graph. (If an answer does not exist, enter DNE.)

(c) Describe the behavior of the function as $x \to 0$.

as $x \to 0$, $\frac{4 \sin x}{x} \to 4$

(d) How many solutions does the equation

$$\frac{4 \sin x}{x} = 0$$

Nice Notation

$\frac{4 \sin x}{x} \xrightarrow{x \to 0} 4$

$\lim_{x \to 0} \frac{4 \sin x}{x} = 4$

have in the interval $[-8, 8]$? (If there are infinitely many solutions, enter INFINITELY MANY.)

[ ] solution(s)

Graphing utility.

$\frac{4 \sin x}{x} = 0 \Rightarrow 4 \sin x = 0$

Find the solutions. (Enter your response in radians.)

$\Rightarrow \sin x = 0 \Rightarrow x = 0, \pm\pi, \pm 2\pi$

5 solns in $[-8, 8]$

$x =$ $0, \pm\pi, \pm 2\pi$

Last tidbit

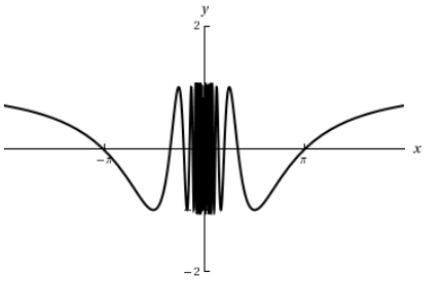
$\frac{\sin x}{x} \xrightarrow{x \to \pm\infty} 0$

47. –/9 points LarTrig9 2.3.088.

Consider the function

$$f(x) = \cos\frac{5}{x}$$

and its graph shown in the figure.



(a) What is the domain of the function? (Enter your answer using interval notation.)

(b) Identify any symmetry of the graph.

Identify any asymptotes of the graph. (If an answer does not exist, enter DNE.)

(c) Describe the behavior of the function as $x \to 0$.

(d) How many solutions does the equation

$$\cos\frac{5}{x} = 0$$

have in the interval $[-5, 5]$? (If there are infinitely many solutions, enter INFINITELY MANY.)

[ ] solution(s)

(e) Does the equation $\cos(5/x) = 0$ have a greatest solution? If so, then approximate the solution. (Round your answer to four decimal places. If there is no greatest solution, enter NO SOLUTION.)

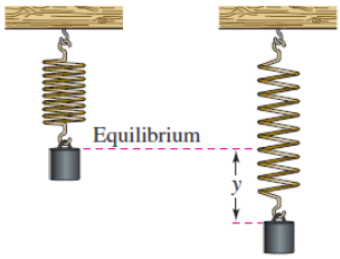
$x =$ [ ]

48. –/1 points LarTrig9 2.3.089. My Notes Ask Your Teac

A weight is oscillating on the end of a spring (see figure). The position of the weight relative to the point of equilibrium is given by

$$y = \frac{1}{12}(\cos 8t - 9 \sin 8t)$$

where y is the displacement (in meters) and t is the time (in seconds). Find the times when the weight is at the point of equilibrium $(y = 0)$ for $0 \le t \le 1$. (Enter your answers as a comma-separated list. Round your answers to two decimal places.)



49. –/1 points LarTrig9 2.3.097. My Notes Ask Your Teac

Fin e smallest positive fixed point of the function f. [A *fixed point* of a function f is a real number c such that $f(c) = c$.]

$f(x) = \tan(\pi x/4)$

50. –/2 points LarTrig9 2.3.098.MI.SA. My Notes Ask Your Teache

This question has several parts that must be completed sequentially. If you skip a part of the question, you will not receive any points for the skipped part, and you will not be able to come back to the skipped part.

Tutorial Exercise

Find the smallest positive fixed point of the function f. [A *fixed point* of a function f is a real number c such that $f(c) = c$.]

$f(x) = -\cos x$