

A Little More On Verifying Equations

$$12. \quad \frac{\csc x - 1}{1 - \sin x} = \boxed{\csc x}$$

$$\frac{\csc x - 1}{1 - \sin x} \quad (1 + \sin x) \quad (1 + \sin x)$$

MULTIPLY NUM & DENOM BY CONJUGATE

$$\frac{\left(\frac{1}{\sin x} - 1\right)(1 + \sin x)}{1 - \sin^2 x}$$

SUBSTITUTE RECIPROCAL IDENTITY
& MULTIPLY

$$\frac{\frac{1}{\sin x} + 1 - 1 - \sin x}{1 - \sin^2 x}$$

MULTIPLY

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

ADD

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

} common denominator

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

ADD NUMERATOR

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

WRITE DENOM. AS FRACTION

$$\frac{1 - \sin^2 x}{\sin x} \cdot \frac{1 - \sin^2 x}{1}$$

REWRITE COMPLEX FRACTION AS A DIVISION PROBLEM

$$\frac{1 - \sin^2 x}{\sin x} \cdot \frac{1}{1 - \sin^2 x}$$

MULTIPLY BY RECIPROCAL
& CANCEL "1 - sin² x" FACTORS

$$\frac{1}{\sin x}$$

$$\csc x$$

SUBSTITUTE RECIPROCAL IDENTITY

$$51. \quad \frac{1}{\cot x + 1} + \frac{1}{\tan x + 1} = 1$$

$$\frac{1}{(\cot x + 1)(\tan x + 1)} + \frac{1}{(\tan x + 1)(\cot x + 1)}$$

FIND COMMON DENOMINATOR

$$\frac{\tan x + 1}{\cot x \tan x + \cot x + \tan x + 1}$$

ADD FRACTIONS

& MULTIPLY THE DENOMINATOR

$$\cot x \cdot \tan x = \frac{1}{\tan x} \cdot \frac{\tan x}{1} = 1$$

$$\frac{\cot x + \tan x + 2}{\cot x + \tan x + 2}$$

COMBINE LIKE TERMS & APPLY COMMUTATIVE PROPERTIES
SUBSTITUTE & COMBINE LIKE TERMS

$$1 = 1$$

ANY QUESTIONS ON VERIFYING EQUATIONS?

(Short Quiz tomorrow $\rightarrow$ verifying, 5.2 & 5.1 $\therefore$ you need to know the identities)

5.3: Solving Equations

Is x A solution?

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

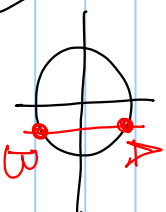
A) $x = \pi/3$

B) $5\pi/3 = x$

using the unit circle: $2\cos x = 1$

$$\cos x = 1/2$$

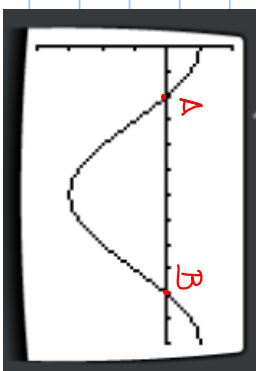
$$x = \cos^{-1}(1/2)$$



using a graph & x-intercepts:



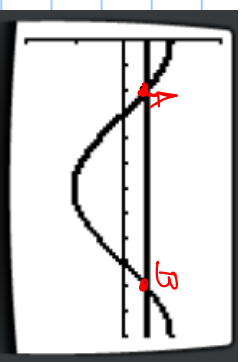
$\rightarrow 2\pi$
 $\rightarrow \pi/6$



USING A SYSTEM: $\cos x = 1/2$



$Y_1 = \cos(X)$
 $Y_2 = 1/2$
 $\rightarrow \pi/6$



You only need one method, but options exist :

You try #5: $2\sin^2 x - \sin x - 1 = 0$

A) $x = \pi/2$ & B) $x = 7\pi/6$

$$2a^2 - a - 1 = 0 \rightarrow (2a+1)(a-1) = 0$$

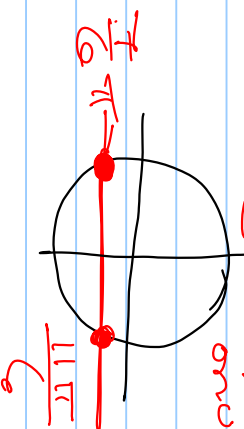
$$(2\sin x + 1)(\sin x - 1) = 0$$

$$\text{IF } 2\sin x + 1 = 0$$

$$2\sin x = -1$$

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

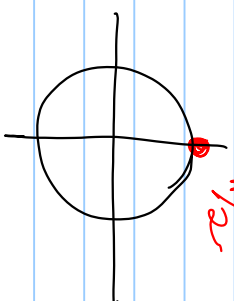
$x = -\frac{\pi}{2}$ or $\pi - \frac{\pi}{2}$



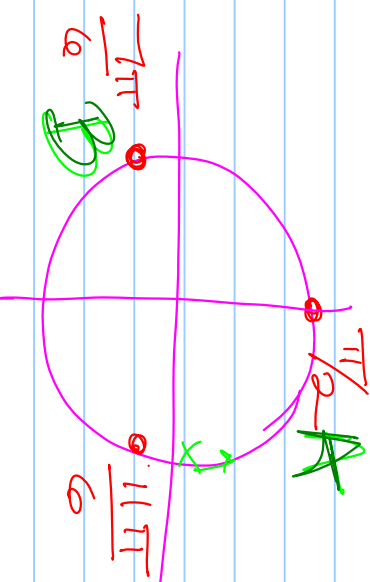
$$\text{IF } \sin x - 1 = 0$$

$$\sin x = 1$$

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



COMBINED WORK



FIND ALL SOLUTIONS FROM $[0^\circ, 360^\circ)$, ↙ INCLUSIVE

7) $\sin x = \frac{1}{2}$

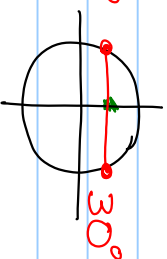
$y = \frac{1}{2}$ on Unit Circle

MAY USE ANY METHOD, I LIKE THE UNIT CIRCLE.

$x = 30^\circ \& 150^\circ$

150°

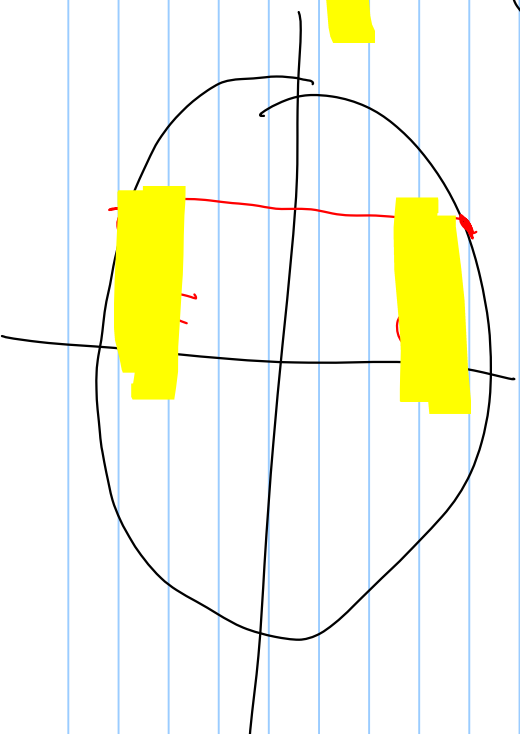
30°



You Try #9) $\cos x = -\frac{1}{2}$

$x =$

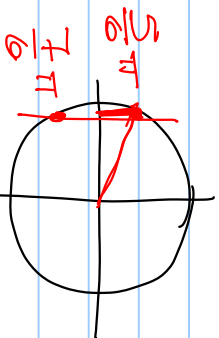
[redacted]



Find All Solutions from $[0, 2\pi)$. Use any method.

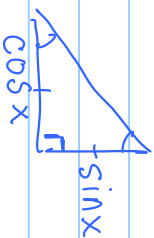
13. $\cos x = -\sqrt{3}/2$

$x = \frac{5}{6}\pi$ & $\frac{7}{6}\pi$

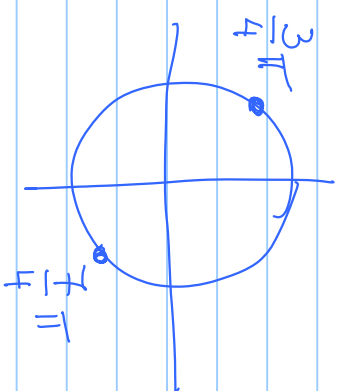


You Try #15 $\cot x = -1$

$\frac{\cos x}{\sin x} = -\frac{n}{n}$



$x = \frac{3}{4}\pi$ & $\frac{7}{4}\pi$



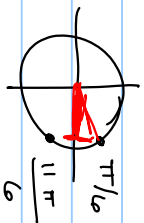
Solve *

$$27) \sqrt{3} \sec x - 2 = 0$$

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

$$\frac{\sec x}{1} = \frac{2}{\sqrt{3}}$$

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



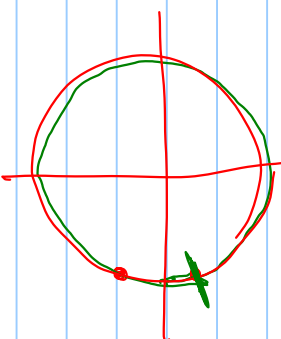
$$x = \frac{\pi}{6} \text{ \& \; } \frac{11\pi}{6}$$

FROM 0 TO 2π

* DIRECTIONAL DIDN'T SPECIFY AN INTERVAL,
 $\therefore$ INFINITE

THESE SOLUTIONS WILL REPEAT
EVERY ROTATION, $\underline{n}$.

$$x = \frac{\pi}{6} + 2\pi n \text{ \& \; } \frac{11\pi}{6} + 2\pi n$$



You try 29) $3 \csc^2 x - 4 = 0$

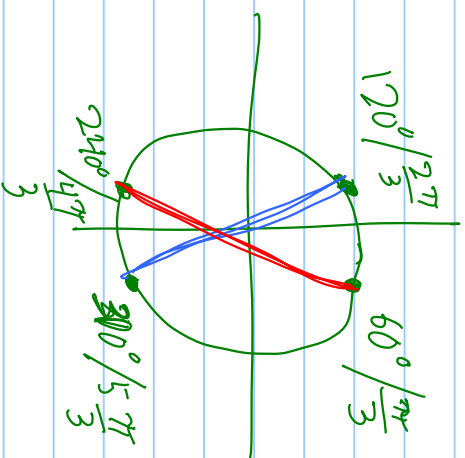
$$\frac{3 \csc^2 x = 4}{3}$$

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

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

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

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



$$\left[\begin{array}{l} \frac{\pi}{3} + 2\pi n \\ \frac{2\pi}{3} + 2\pi n \\ \frac{4\pi}{3} + 2\pi n \\ \frac{5\pi}{3} + 2\pi n \end{array} \right]$$

OR

$$\left[\begin{array}{l} \frac{\pi}{3} + \pi n \\ \frac{2\pi}{3} + \pi n \end{array} \right]$$

FIND ALL SOLUTIONS, $[0, 2\pi)$, ALGEBRAICALLY. USE TABLE FEATURE TO CHECK

41) $\sec^2 x - \sec x = 2$

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

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

LOOKS LIKE $a^2 - a - 2 = 0$

FACTORS LIKE $(a - 2)(a + 1) = 0$

MULTIPLICATIVE PROP OF ZERO: IF A PRODUCT EQUALS ZERO THEN AT LEAST ONE OF FACTORS MUST BE ZERO.

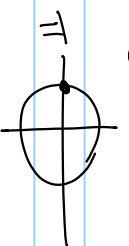
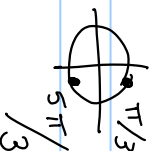
1. $\sec x - 2 = 0$ & 1. $\sec x + 1 = 0$

THEN $\sec x = 2$

$\sec x = -1$

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

$\cos x = -1$



X=0

X	Y1
0	-2
5.2236	-1.821
1.0942	0
1.5708	ERROR
2.0944	0
2.618	4.8803
3.1416	0

X=6.28318530718

X	Y1
3.1416	0
3.6652	4.8803
4.1888	0
4.7124	ERROR
5.236	0
5.7596	-1.821
6.2832	-2