

11/9  
FRI

"Factor"

Assume  $[0, 2\pi)$

5.5 (part 1) Trigonometric Equations

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

set one side to zero

→ If  $A \cdot B = 0$  then  $A = 0$  or  $B = 0$

ex 1) Solve  $2\sin^2 t - 3\sin t + 1 = 0$

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

$2\sin t - 1 = 0$

$2\sin t = 1$

$\sin t = \frac{1}{2}$

$t = \sin^{-1}(\frac{1}{2})$

$t = \frac{\pi}{6}, \frac{5\pi}{6}$

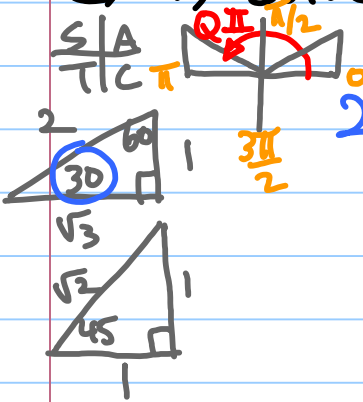
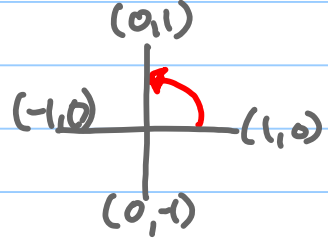
$\sin t - 1 = 0$

$\sin t = 1$

$t = \sin^{-1}(1)$

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

ref 4  
QII:  $\pi - \frac{\pi}{6}$



ex 2)  $4\cos^2 x - 3 = 0$

$4\cos^2 x = 3$

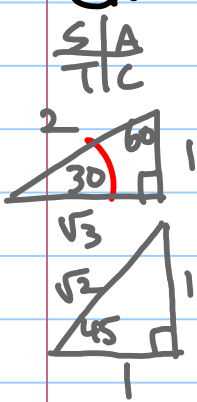
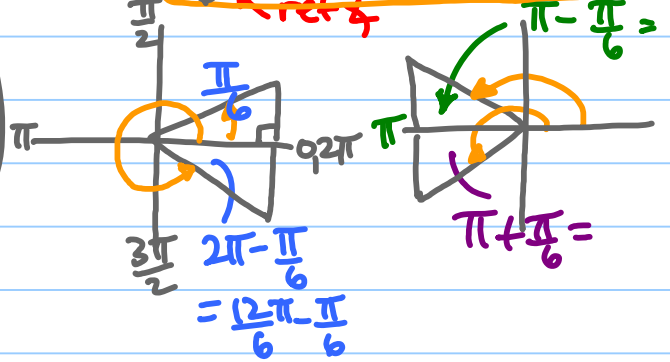
$\cos^2 x = \frac{3}{4}$

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

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

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

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



ex 3)  $\sin x \tan x = \sin x$

\* cannot divide by sin

$\sin x \tan x - \sin x = 0$

$xy - x = 0$

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

factor a gcf.

$\sin x = 0$

$\tan x - 1 = 0$

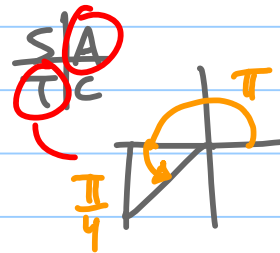
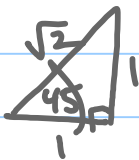
$x = \sin^{-1} 0$

$\tan x = 1$

$x = 0, \pi$

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

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



ex 4)  $2 \sin^2 x - 3 \cos x = 0$

"Twist"  
replace  $\sin^2 x$   
distrib

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

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

$-2 \cos^2 x - 3 \cos x + 2 = 0$  mult by -1

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

$2 \cos x - 1 = 0$

$\cos x + 2 = 0$

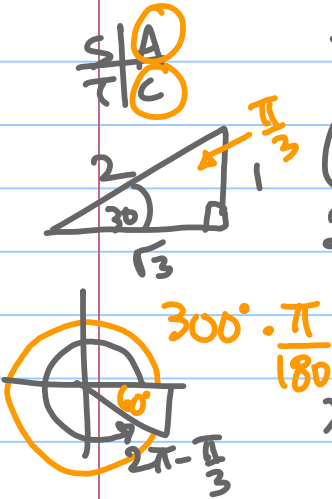
$\cos x = \frac{1}{2}$

$\cos x = -2$

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

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

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



ex 5)  $\cos 2x + \sin x = 0$

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

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

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

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

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

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

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

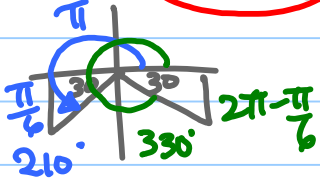
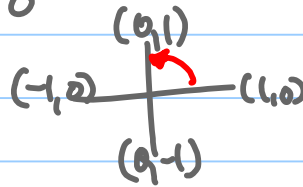
$\sin x = 1$

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

$x = \sin^{-1}(1)$

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

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



ex 6)  $\cos x - \sin x = 1$  \* Square both sides

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

$$(\cos x - \sin x)(\cos x - \sin x) = 1$$
 \* FOIL

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

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

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

$$\sin x \cos x = 0$$

$$\sin x = 0 \quad \cos x = 0$$

$$x = \sin^{-1}(0) \quad x = \cos^{-1}(0)$$

$$x = 0, \pi \quad x = \frac{\pi}{2}, \frac{3\pi}{2}$$

\* If you square both sides, you must check your answers

Check

$x=0$ :

$\cos 0 - \sin 0 = 1$   
 $1 - 0 = 1$  (smiley face)

~~$x=\pi$~~ :

$\cos \pi - \sin \pi = 1$   
 $-1 - 0 = 1$  (sad face)

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

$\cos \frac{\pi}{2} - \sin \frac{\pi}{2} = 1$   
 $0 - 1 = 1$  (sad face)

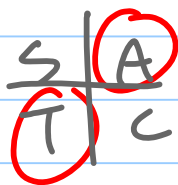
$x=\frac{3\pi}{2}$ :

$\cos \frac{3\pi}{2} - \sin \frac{3\pi}{2} = 1$   
 $0 - (-1) = 1$  (smiley face)

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

ex 7)  $\tan x = 3.1044$

$x = \tan^{-1}(3.1044)$



angle  
 $x = 1.2592$

tan is also + in QIII:



$x = \pi + 1.2592 = 4.4008$

Radian Mode

ex 8)  $\sin x = -.2315 \rightarrow \sin x = .2315$  (ref  $x$ )

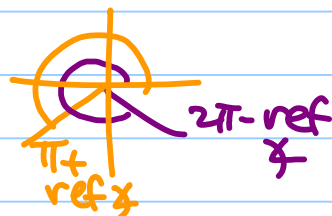
$x = \sin^{-1}(.2315)$

$x = .2336$



QIII:  $\pi + .2336 = 3.3752$

QIV:  $2\pi - .2336 = 6.0496$



$$x^2 + 5x + 3 = 0$$

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

ex 9)  $\cos^2 x + 5\cos x + 3 = 0$

Quadratic Formula

$$\cos x = \frac{-(5) \pm \sqrt{(5)^2 - 4(1)(3)}}{2(1)}$$

$$\cos x = \frac{-5 \pm \sqrt{25 - 12}}{2} = \frac{-5 \pm \sqrt{13}}{2} \rightarrow \text{decimal}$$

$$\cos x = \frac{-5 + \sqrt{13}}{2} \quad \text{or} \quad \frac{-5 - \sqrt{13}}{2}$$

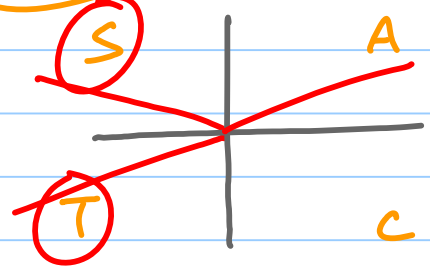
$$\cos x = -.6972 \quad \text{or} \quad -4.3028$$

neg  $x = \cos^{-1}(.6972) \leftarrow \text{ref } x$

$$x = .7993 \text{ ref } x$$

$$\text{Q II: } \pi - .7993 = 2.3422$$

$$\text{Q III: } \pi + .7993 = 3.941$$



HW p636, #39-89 Every Other Odd, skip 75  
add 91, try\*81