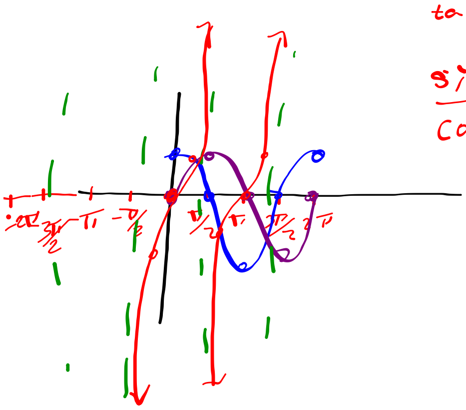
$\sin\theta$:
$\cos\theta$:
$\tan\theta$:

$\frac{\sin}{\cos} = \frac{y}{x}$



π

unit 1
degrees → radians

unit 2
$P(\theta) = (\cos\theta, \sin\theta)$
if $\theta = \ldots$, find (x, y)
if $(x, y) = \ldots$, find θ

$\theta' \neq \theta$
$f(\theta') = (f(\theta))$

$\theta' = \theta + kP$
$k \in \mathbb{Z}$

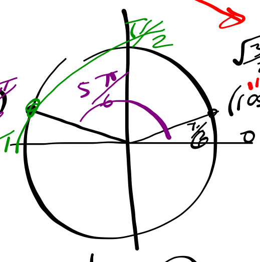
unit 3 $f(x) = \sin x$
find $f(\pi/2)$

unit 4 $g(x) = \sec x$
find $g(\pi/2)$
$= \frac{1}{\cos x}$

unit 5
$g(x) = a\sin b(x-h) + k$

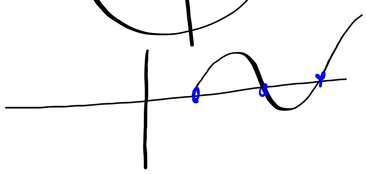
unit 6 if $\sin x = \frac{1}{2}$ ($\sin^{-1}$)
what $\cos x$
$x \in [\pi/2, \pi]$

$-\frac{\sqrt{3}}{2}$ $\frac{1}{2}$
$(\cos\frac{5\pi}{6}, \sin\frac{5\pi}{6})$



$\frac{\sqrt{3}}{2}, \frac{1}{2}$
$(\cos\frac{\pi}{6}, \sin\frac{\pi}{6})$

$0.52 = \frac{\pi}{6}$



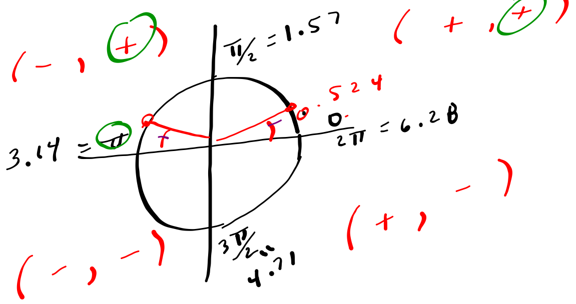
unit 8 (unit 7 tomorrow)

Unit 8: Solving simple trig equations in 1st or 2nd degree

$b = 1$
$h = 0$

Step i. Solve by doing opposite operations and find x_1 (first solution in the cycle) (isolate trig term and refer to unit circle)

Step ii. Find x_2 by adding or substract $|x_1|$ from $0, \pi, 2\pi$ by considering the function (sin or cos) and the sign of the trig points in quadrants.



Step iii. Once you find x_1 and $x_2 \in [0, 2\pi]$, find corresponding angles x_1', x_2' by adding $2k\pi$, $k \in Z$ such that x_1' and x_2' belong to given interval.

ex. Knowing that $x \in [0, 2\pi]$ solve the following equation

$$2\sin x - 1 \overset{+1}{} = 0 + 1$$

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

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

$$x_1 = 0.524$$

$$x_2 = \pi - x_1$$

$$x_2 = \pi - 0.524$$

$$x_2 = 2.618$$

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

$$\cancel{\sin^{-1}} \sin x = \cancel{\sin^{-1}} \sin \pi/6$$

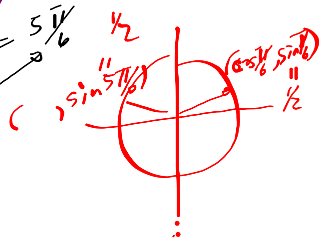
$$x_1 = \pi/6$$

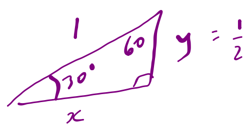
or

$$\cancel{\sin^{-1}} \sin x = \cancel{\sin^{-1}} \sin 5\pi/6$$

$$x_2 = 5\pi/6$$

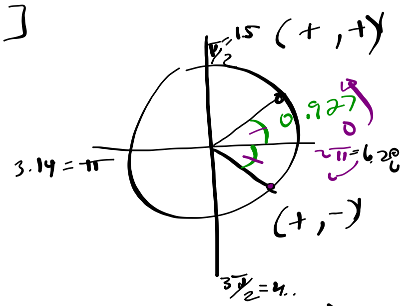
find $1/2$ on unit circle w respect to y coordinates





$$ANS = \{0.524, 2.618\}$$
$$= \{\pi/6, 5\pi/6\}$$

Solve given $x \in [-\pi, -2\pi]$



$$5\cos x - 1 = 2 \quad (+1, +1)$$

$$\frac{5\cos x}{5} = \frac{3}{5}$$

$$\cos^{-1}(\cos x) = \cos^{-1}(3/5)$$

$$x_1 = 0.927$$

$$P(\theta) = (\cos\theta, \sin\theta)$$

$$x_2 = k\pi \pm x_1 \qquad k \in \mathbb{Z}$$

$$x_2 = 2\pi - 0.927$$

$$x_2 = 5.356$$

---

step iii find

$x_1' \in [-\pi, -2\pi]$ (-3.14, -6.28)

$$x_1' = x_1 - 2\pi$$

$$x_1' = 0.927 - 2\pi$$

$$x_1' = -5.356$$

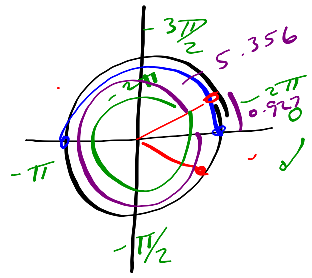
find

$x_2' \in [-\pi, -2\pi]$

$$x_2' = x_2 - 2\pi$$

$$x_2' = 5.356 - 2\pi$$

$$x_2' = -0.927 \notin [-\pi, -2\pi]$$



Solve given that $x \in [\pi/2, 4\pi]$
$1.57, 12.566$

$4\sin x - 1 = 0$

$x_1 = 0.253$ ✗

$x_1' = x_1 + P$
$x_1' = 0.253 + 2\pi$
$x_1' = 6.536$ ✓

$x_1'' = 6.536 + 2\pi$
$x_1'' = 12.82$ ✗

$x_2 = 2.889$ ✓

$x_2' = 2.889 + 2\pi$
$x_2' = 9.17$ ✓
$x_2'' = 9.17 + 2\pi$
$x_2'' = 15.45$ ✗

ANS = {2.889, 6.536, 9.17}

Solve the following equation

for $x \in \left[\frac{\pi}{2}, \frac{7\pi}{2}\right]$

$\frac{\pi}{2} = 1.57$ $\quad \frac{7\pi}{2} = 10.996$

$-13\sin x - 2^{+2} = 3^{+2}$

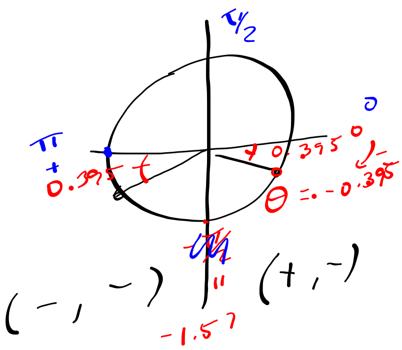
$\frac{\cancel{-13}\sin x}{\cancel{-13}} = \frac{5}{-13}$

$\cancel{\sin^{-1}\sin} x = \sin^{-1} -\frac{5}{13}$

$x_1 = -0.395$

$x_1' = -0.395 + 2\pi$

$x_1' = 5.89$



ANS $\{3.537,\ 5.89,\ 9.82\}$

$x_2 = \pi + 0.395$

$x_2 = 3.537$

$x_2' = 3.537 + 2\pi$

$x_2' = 9.82$

Solve given $x \in \left[\frac{3\pi}{2}, 4\pi\right]$

$-3\sin x - 1 = 0$

Solve given $x \in \mathbb{R}$

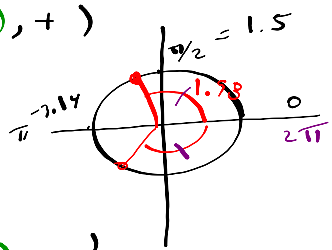
$5\cos x + 2 = 0$
$\quad\ \ -2 \quad -2$

$\frac{\cancel{5}\cos x}{\cancel{5}} = \frac{-2}{5}$

$\cos^{-1}$ $\cos x = -2/5$ $\cos^{-1}$

$x_1 = 1.98$

$(-, +)$



$(-, -)$

$x_2 = 2\pi - 1.98$

$x_2 = 4.30 \in [0, 2\pi)$

$2\pi = 6.28$

ANS $\left\{ \begin{array}{l} 1.98 + 2k\pi \\ 4.30 + 2k\pi \end{array} , \ k \in \mathbb{Z} \right\}$

Solve given that $x \in [0, 4\pi[$

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

let $y = \sin x$

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

$\sin^2 x \neq \sin x^2$

$\sin^2 x = \sin x \cdot \sin x$
$= (\sin x)^2$

$y^2 - y = 0$

$y = \frac{-b \pm \sqrt{\Delta}}{2a}$

$y(y-1) = 0$

so $y = 0$ so $y - 1 = 0$

$\Delta = b^2 - 4ac$

$y = 0$ $\quad$ $y = 1$

now find x by subbing y into $y = \sin x$

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

$x_1 = \pi/2$ ✓ $\quad x_1 = 1.52$

$x_1' = \pi/2 + \frac{2 \cdot 2\pi}{2}$

$x_1' = 5\pi/2$ ✓

$x_1'' = \frac{5\pi}{2} + \frac{2 \cdot 2\pi}{2}$

$x_1'' = \frac{9\pi}{2}$ ✗

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

$x_2 = 0$ ✓ $\quad x_3 = \pi$

$x_2' = 2\pi$ ✓

corresponding angles that belong to $[0, 4\pi[$

$x_3' = x_3 + 2\pi$

$x_3' = \pi + 2\pi$

$x_3' = 3\pi$ ✓

$x_2'' = 2\pi + 2\pi$

$x_2'' = 4\pi$ ✗

ANS = $\{0, \pi/2, \pi, 2\pi, 5\pi/2, 3\pi, \cancel{4\pi}\}$

Solve given $x \in [-2\pi, \pi]$

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

Finding the x-ints/zeros/solutions (complicated $b=?$ $h=?$)

ex. find x-ints

$g(x) = 3\cos 3(x + \frac{2\pi}{3}) + 1$

$0 = 3\cos 3(x + \frac{2\pi}{3}) + 1$ $\quad -1$

step 1. find x_1 by solving. point $y=0$ 1st cuz $(x,0)$ at x-ints

$\frac{-1}{3} = \frac{\cancel{3}\cos 3(x + 2\pi/3)}{\cancel{3}}$

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

keep solving for x

$\frac{1.91}{3} = \frac{\cancel{3}(x + 2\pi/3)}{\cancel{3}}$

$\frac{1.91}{3} - \frac{2\pi}{3} = x + \frac{2\pi}{3} - \frac{2\pi}{3}$

$x_1 = -1.46$

step 2. find x_2, by graphing function and locating x_1. Use symmetric nature of function to find value of x_2.

$g(x) = 3\cos 3(x + \frac{2\pi}{3}) + 1$

$g(x) = a\cos b(x - h) + k$

$a = 3 \to$ amp

$b = 3 \to$ period $= \frac{2\pi}{|b|} = \frac{2\pi}{3}$

$h = -\frac{2\pi}{3}$ $\quad (h, k+a)$ s.p

$(-\frac{2\pi}{3}, 4)$ s.p.

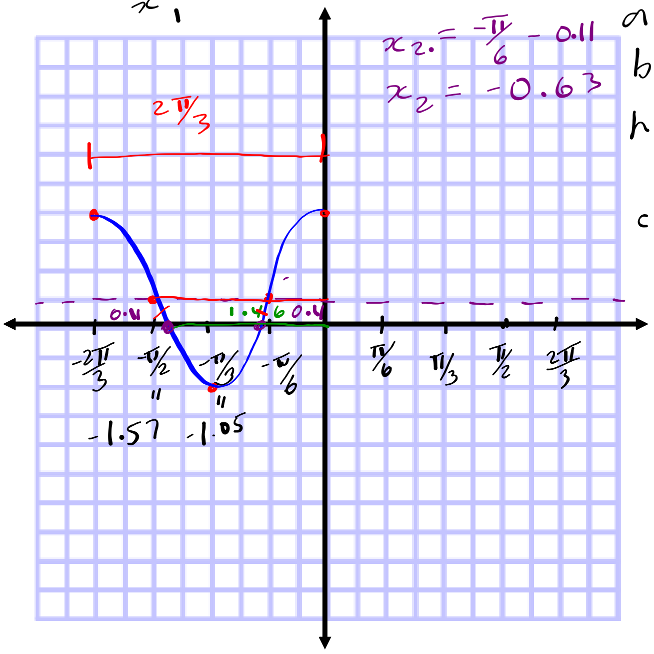
central axis $y = 1$

max/k/min/k/max

P/4 P/4

$x_2 = -\frac{\pi}{6} - 0.11$

$x_2 = -0.63$



HWWK p 8.10 # 1 a) b)
p 8.12 # 2 a) c)
8.16 # 3 a) - d)

HMWK zeros
p 8.16 2 c)
p 5.58 - 5.59
5.64 - 5.67
pg 5.83 #5 a) - d)