I think the 2.3 is likely to be a bit long for some of you. I'd be OK with cutting it about in half, although I don't see a single one of those that doesn't build some muscle.

I just have the sense that tolerance for difficulties is not very high in this class, when difficulties is the name of the game, going forward. I really want the class to transition to a cheerful hardnosed bunch, for whom nothing is too much. You get that going, NOW, and the rest of your career in college and beyond gets a whole lot easier!

But to save you some time, you may do the following problems for 2.3:

#s 1 – 6 All, 11, 15, 19, 23, 27, 31, 35, 37*, 39, 43, 45, 63, 67, 71, 73, 87, 88

* Square Both sides!

And recall, that squaring both sides often introduces extraneous solutions, the same way casting a net often introduces fish you don't want…

122 §2.3 #s $\underset{\text{ALL}}{\underline{1\text{-}6}}$, 11-47, 63-73, 87, 88

① First, <u>isolate</u> the trigs on one side

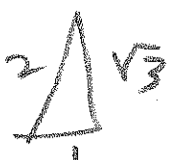
② $2\sin\theta + 1 = 0$ has solns $\theta = \frac{7\pi}{6} + 2n\pi$

OR $\theta = \frac{11\pi}{6} + 2n\pi$, which are <u>general solns</u>

③ $2\tan^2 x - 3\tan x + 1$ is trig eq'n of quadratic type.

④ A soln that doesn't work is <u>extraneous</u>.

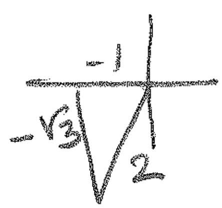
#5-10 verify solns



⑤ $\tan x - \sqrt{3} = 0$

(a) $x = \frac{\pi}{3}$; $\tan\frac{\pi}{3} - \sqrt{3} = \sqrt{3} - \sqrt{3} = 0$ ✓

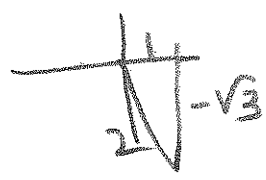
(b) $x = \frac{4\pi}{3}$: $\tan\frac{4\pi}{3} - \sqrt{3} = \sqrt{3} - \sqrt{3} = 0$ ✓



⑥ $\sec x - 2 = 0$

(a) $x = \frac{\pi}{3}$; $\sec\frac{\pi}{3} - 2 = 2 - 2 = 0$ ✓

(b) $x = \frac{5\pi}{3}$: $\sec\frac{5\pi}{3} - 2 = 2 - 2 = 0$ ✓



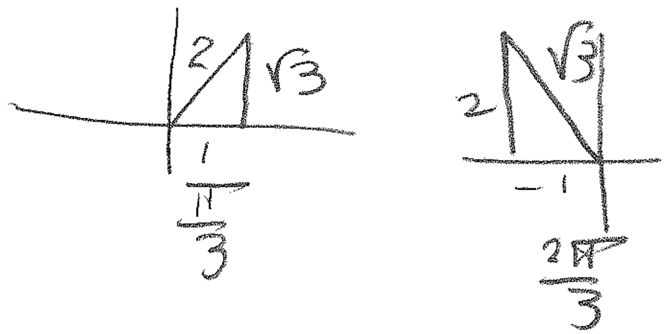
122 §2.3 #s 11-47, 63-73, 87, 88

#s 11-24 Solve!

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

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

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

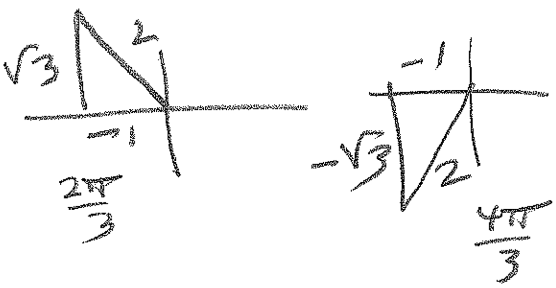


$\Longrightarrow x = \frac{\pi}{3} + 2n\pi$ OR $x = \frac{2\pi}{3} + 2n\pi$, $n \in \mathbb{Z}$

(13) $\cos x + 1 = -\cos x$

$2\cos x = -1$

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



$\Longrightarrow x = \frac{2\pi}{3} + 2n\pi$ OR $x = \frac{4\pi}{3} + 2n\pi$, $n \in \mathbb{Z}$.

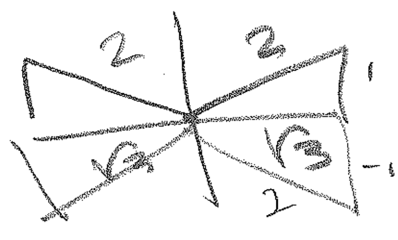
(15) $3\sec^2 x - 4 = 0$

$3\sec^2 x = 4$

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

$|\sec x| = \sqrt{\frac{4}{3}}$

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



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

π apart π apart

$x = \frac{\pi}{6} + n\pi$ OR $x = \frac{5\pi}{6} + n\pi$, $n \in \mathbb{Z}$

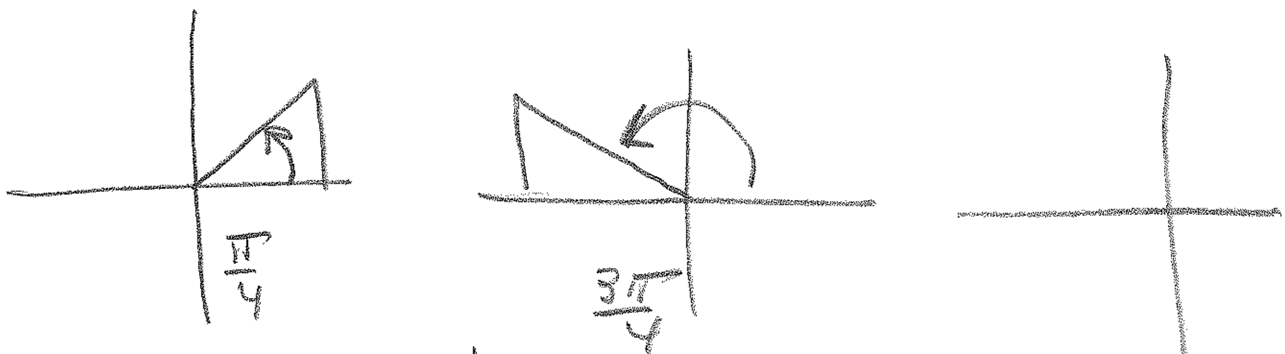
122 §2.3 #s 19-47, 63-73, 87, 88

(19) $2\sin^2(2x) = 1$

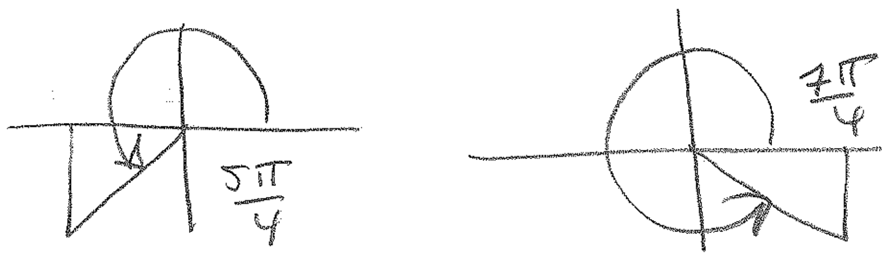
$\sin^2(2x) = \frac{1}{2}$

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

Pictures for 2x:



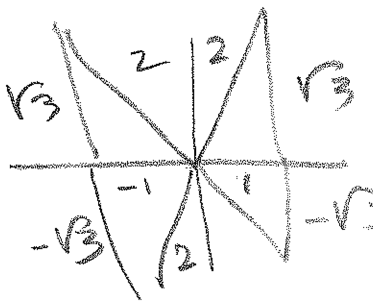
$\sin(2x) = \frac{1}{\sqrt{2}}$



These are solutions of $\sin(2x) = \frac{1}{\sqrt{2}}$ for $2x \in [0, 2\pi]$. But we need to capture all solutions for $x \in 2\pi$, before we can build all solutions with the $+n\pi$ & $+2n\pi$ bit.

099 § 2.3 #s 17–47, 63–73, 87, 88

(17) $4\cos^2 x - 1 = 0$



$4\cos^2 x = 1$

$\cos^2 x = \frac{1}{4}$

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

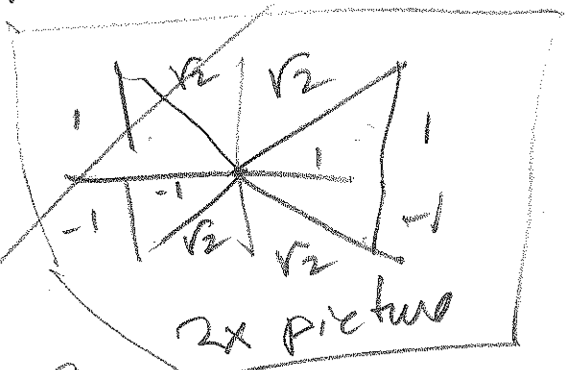
Again, some of these pair up nicely!

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

(19) $2\sin^2(2x) = 1$ SEE NEXT PAGE

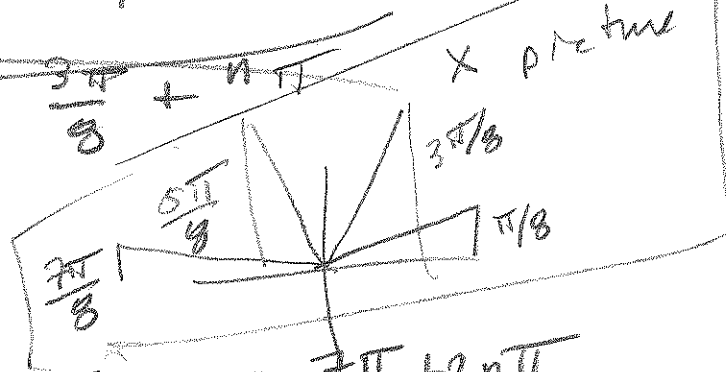
$\sin^2(2x) = \frac{1}{2}$

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



$2x = \frac{\pi}{4}$ OR $2x = \frac{3\pi}{4}$

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



Not that easy!

These aren't π apart!

$x = \frac{\pi}{8} + 2n\pi,\ \frac{3\pi}{8} + 2n\pi,\ \frac{5\pi}{8} + 2n\pi,\ \frac{7\pi}{8} + 2n\pi$, $n \in \mathbb{Z}$

Not that hard!

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

$\boxed{x = \frac{\pi}{8} + n\frac{\pi}{2} \text{ OR } x = \frac{3\pi}{8} + \frac{n\pi}{2}}$!

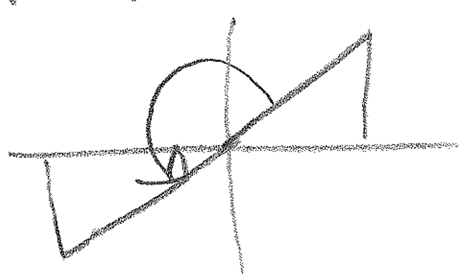
So, $2x = \frac{\pi}{4} + 2n\pi$

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

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

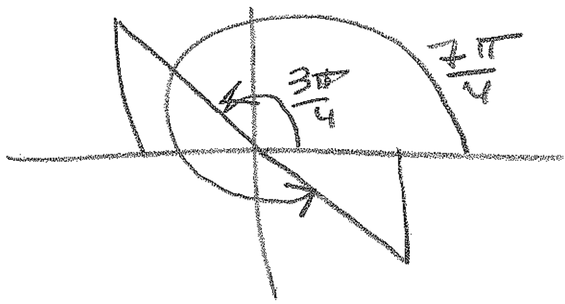
$2x = \frac{7\pi}{4} + 2n\pi$

We can collapse some of this by observing that $\frac{\pi}{4}$ & $\frac{5\pi}{4}$ are π radians apart:



This means that $2x = \frac{\pi}{4} + n\pi$ will capture all of them

and $2x = \frac{3\pi}{4} + n\pi$ will capture all of these guys:



$\frac{3\pi}{4}$ & $\frac{7\pi}{4}$ are also π radians apart.

122 §2.3 #s 19–47, 63–73, 87, 88

19 cnt'd

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

OR

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

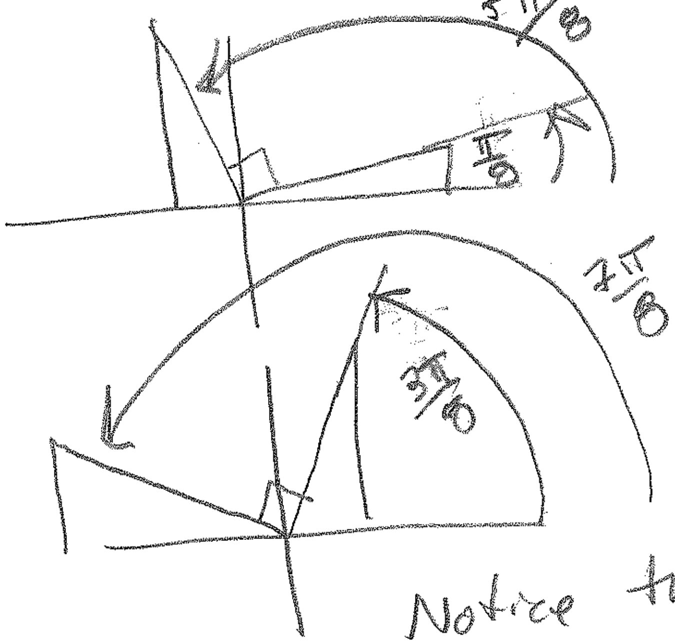
captures all solutions for $2x$

Now, just divide by 2:

FINAL ANS

$$\boxed{\begin{array}{c} x = \frac{\pi}{8} + \frac{n\pi}{2} \\ \text{OR} \\ x = \frac{3\pi}{8} + \frac{n\pi}{2} \end{array}}$$

Captures all the solutions for x.

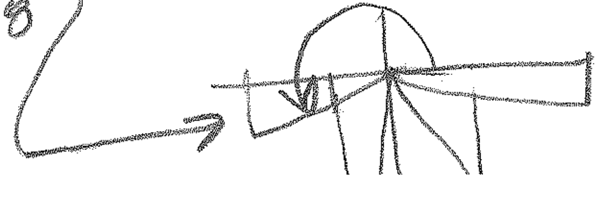


are $\frac{\pi}{2}$ apart

are $\frac{\pi}{2}$ apart

Notice that pictures for $2x$ in $[0,2\pi]$ collapses to x in $[0,\pi]$? So we lose half of what's going on for $x \in [0,2\pi]$

$$\frac{\frac{13\pi}{4}}{2} = \frac{13\pi}{8}$$



These are the angles that come from going twice around with $2x$.

'22 § 2.3 #s 19–47, 63–72, 87, 88

The up-shot is that if you capture all solutions $2x$ for $\sin(2x) = \pm \frac{1}{\sqrt{2}}$, then you divide by 2 to get solutions x.

~~You~~ will sometimes find book answers that are more elegant, but that comes from observing things like $\frac{5\pi}{4} - \frac{\pi}{4} = \pi$

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

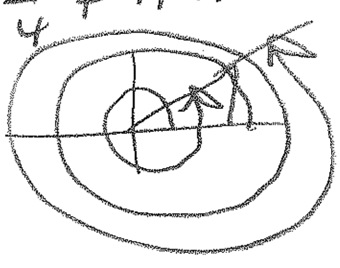
OR

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

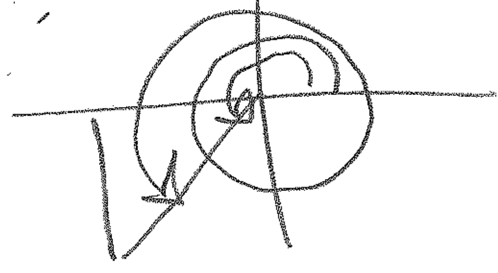
collapses down to

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

When n is even



When n is odd:



Hope this helps!

122 § 2.3 #s 21-47, 68-77, 87, 88

21 $\tan(3x)\,(\tan(x)-1)=0 \Longrightarrow$

$\tan(3x)=0$ OR $\tan x - 1 = 0$

$\tan x = 1$

$3x = 0 + n\pi = n\pi$

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

$\frac{\pi}{4}, \frac{5\pi}{4}$?

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

OR

$\frac{5\pi}{4} + 2n\pi$

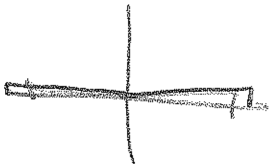
collapses to

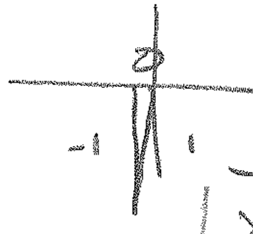
$\boxed{\frac{\pi}{4} + n\pi}$

122 §2.3 #s 23-47, 68-73, 87, 88

23. $\sin x(\sin x+1)=0$

$\sin x = 0$ $\quad\quad$ $\sin x = -1$





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

(from $x = 0 + 2n\pi$
OR
$x = \pi + 2n\pi$)

#s 25-38 Find all solutions in the interval $[0, 2\pi]$

25. $\cos^3 x = \cos x$

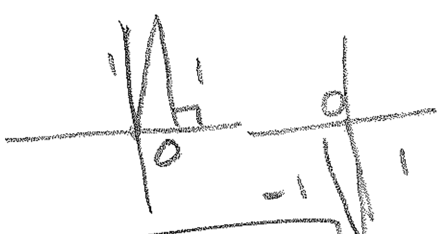
$\cos^3 x - \cos x = 0$

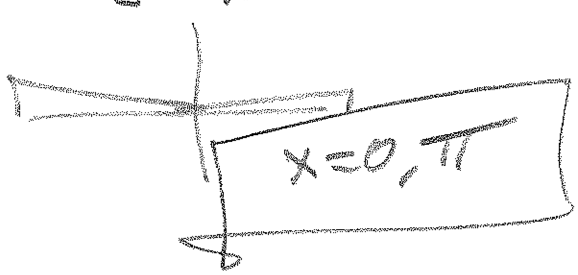
$\cos x(\cos^2 x - 1) = 0$

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

$-\sin^2 x = 0$

$\sin x = 0$





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

122 § 2.3 #s 27-47, 68-73, 87, 88

27 $3\tan^3 x = \tan x$

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

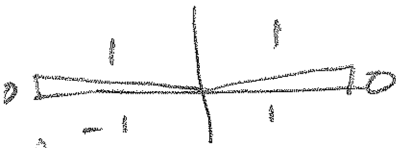
$\tan x\,(3\tan^2 x - 1) = 0$

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

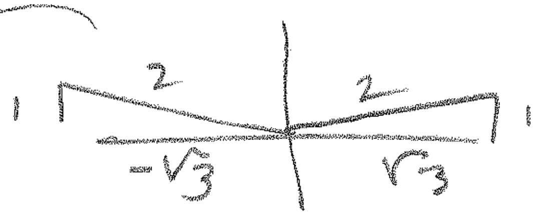
$3\tan^2 x = 1$

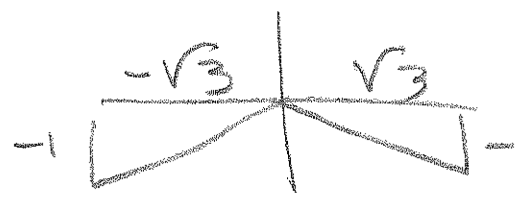
$\tan^2 x = \frac{1}{3}$

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



$\boxed{\begin{array}{l} x = 0, \pi \\ x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6} \end{array}}$





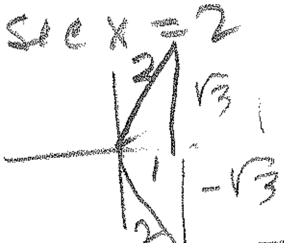
29 $\sec^2 x - \sec x = 2$

$u^2 - u - 2 = 0$

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

$u = 2$ $\quad$ $u = -1$

$\sec x = 2$ $\quad$ $\sec x = -1$



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

122 §2.3 #s 31-47, 63-73, 87, 88

(31) $2\sin x + \csc x = 0$

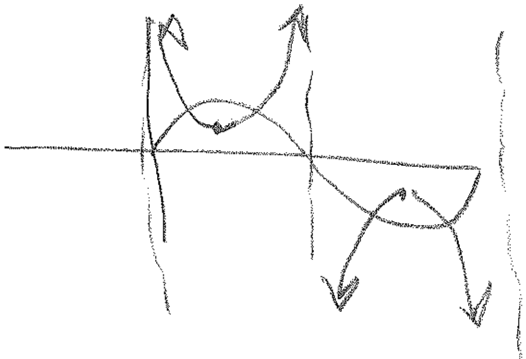
$$2\sin x + \frac{1}{\sin x} = 0$$

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

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

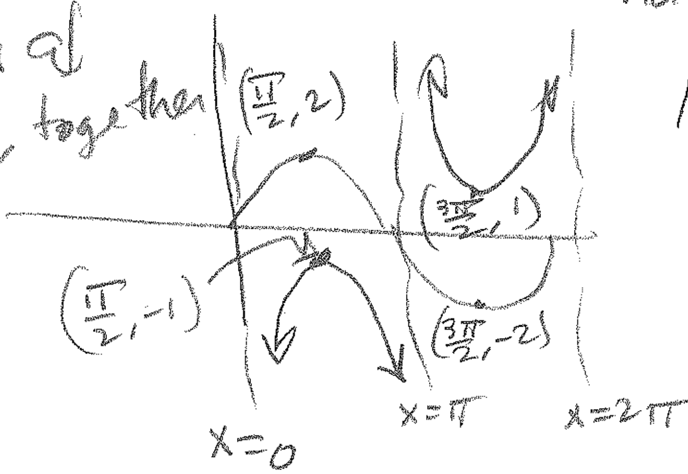
$\boxed{\sin^2 x = -\frac{1}{2} \text{ Impossible}}$?!

But doesn't it have this picture?



$2\sin x = \csc x$, yeah. It has solutions. But we have $2\sin x = -\csc x$, which has no solution.

2 sin x & csc x, together



No intersections

OK.

122 §2.3 #s 33-47, 63-73, 87-88

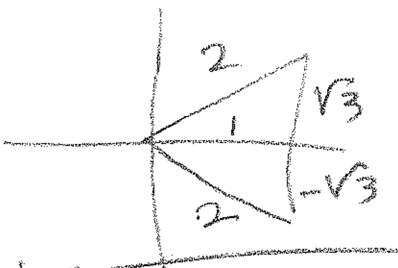
33 $2\cos^2 x + \cos x - 1 = 0$

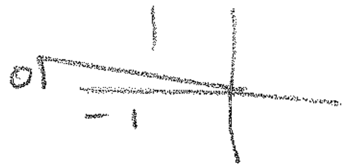
$2u^2 + u - 1 = 0$

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

$u = \frac{1}{2}$ $\qquad$ $u = -1$

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





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

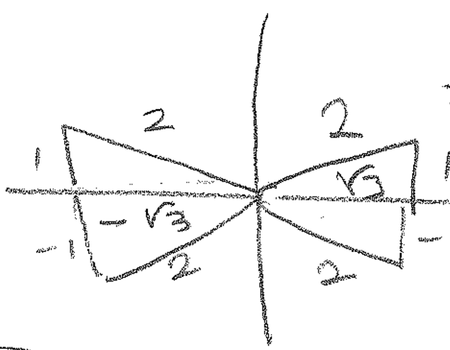
35 $2\sec^2 x + \underline{\tan^2 x} - \quad = 0$

$2\sec^2 x + \underline{\sec^2 x - 1} - 3 = 0$

$3\sec^2 x - 4 = 0$

$3\sec^2 x = 4$

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

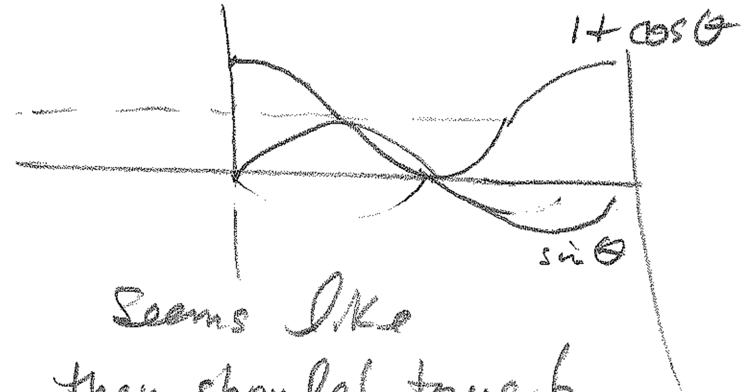


$\sec x = \pm\sqrt{\frac{4}{3}} = \pm\frac{2}{\sqrt{3}}$

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

122 §2.3 #s 37–47, 65–73, 87, 88

37 $\csc x + \cot x = 1$



$$\frac{1}{\sin x} + \frac{\cos x}{\sin x} - 1 = 0$$

$$\frac{1 + \cos x - \sin x}{\sin x} = 0$$

$$1 + \cos x - \sin x = 0$$

$$1 + \cos x = \sin x$$

Seems like they should touch @ $x = \frac{\pi}{2}$, $x = \pi$.

But the algebra isn't obvious.

EXAMPLE 6 says try squaring both sides. GOOD ADVICE.

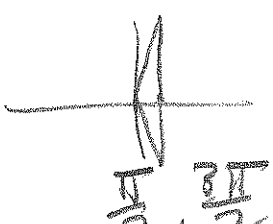
$$\cos x + 1 = \sin x$$

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

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

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

$\cos x = 0$ $\qquad$ $\cos x = -1$



CHECK

$\csc \frac{3\pi}{2} + \cot \frac{3\pi}{2} = 1$?

$-1 + 0 = 1$?

Nope

$\csc \frac{\pi}{2} + \cot \frac{\pi}{2} = 1$?

$1 + 0 = 1$?

Yep.

My picture says $\frac{3\pi}{2}$ won't work. Let's Check.

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

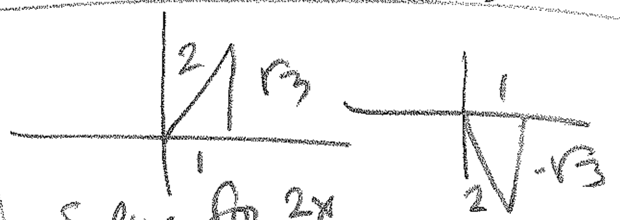
$\frac{3\pi}{2}$ is extraneous

122 §2.3 #s 39-47, 63-73, 87, 88

(39) $2\cos(2x) - 1 = 0$

$2\cos(2x) = 1$

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



Sol'ns for 2x
$\cos(2x) = \frac{1}{2}$

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

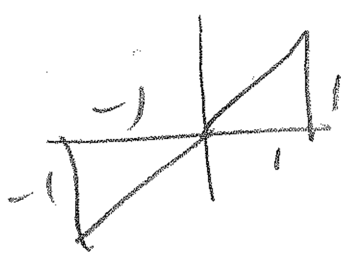
OR

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

$\longrightarrow$ $\boxed{x = \frac{\pi}{6} + n\pi \quad \text{OR} \quad x = \frac{5\pi}{6} + n\pi}$

(41) $\tan(3x) - 1 = 0$

$\tan(3x) = 1$



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

$\boxed{x = \frac{\pi}{12} + \frac{n\pi}{3}}$

* from $3x = \frac{\pi}{4} + 2n\pi$ & $3x = \frac{5\pi}{4} + 2n\pi$
which collapse down to
$3x = \frac{\pi}{4} + n\pi$

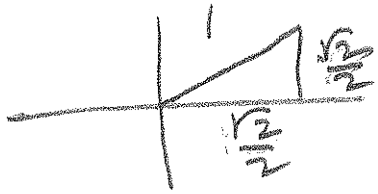
$\cancel{x = \frac{\pi}{12}}$

122 §2.3 #s 43-47, 63-73, 87, 88

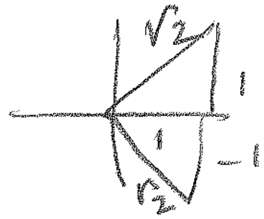
(43) $2\cos\left(\frac{x}{2}\right) - \sqrt{2} = 0$

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

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



OR



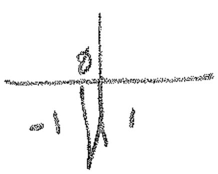
So $\frac{x}{2} = \frac{\pi}{4}$ OR $\frac{7\pi}{4}$ $\longrightarrow$ $(+\,2n\pi)$

$$\boxed{x = \frac{\pi}{2} + 4n\pi \quad \text{OR} \quad x = \frac{7\pi}{2} + 4n\pi}$$

#s 45-48 Find x-intercepts (Doing same thing.)

(45) $y = \sin\left(\frac{\pi x}{2}\right) + 1 \overset{\text{SET}}{=} 0$ $\longrightarrow$

$\sin\left(\frac{\pi x}{2}\right) = -1$



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

$x = \frac{3\pi}{2} \cdot \frac{2}{\pi} + \frac{2n\pi}{1} \cdot \frac{2}{\pi}$ $\longrightarrow$

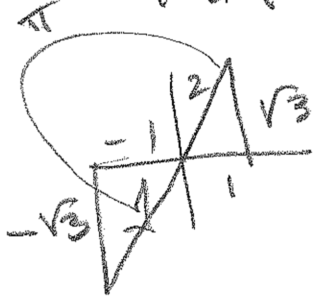
$\boxed{x = 3 + 4n}$ $n \in \mathbb{Z}$

122 §2.3 #s 47, 63-73, 87-8

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

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

$\tan\left(\frac{\pi x}{6}\right) = \pm\sqrt{3}$ $\Longrightarrow x = \frac{\pi}{3} \cdot \frac{6}{\pi} + \frac{n\pi}{1} \cdot \frac{6}{\pi}$



$\Longrightarrow \boxed{x = 2 + 6n}$

#s 63-74 Use inverse funcs, as needed, to find all solutions. (When things aren't "nice" in radians, degrees can really help you "see.") Assume $x \in [0, 2\pi]$

(63) $\tan^2 x + \tan x - 12 = 0$

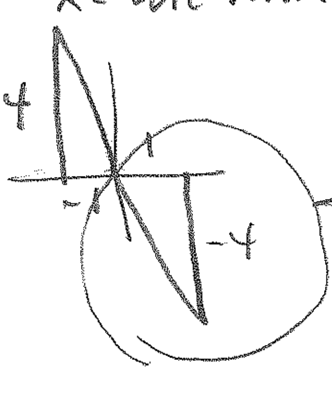
$u^2 + u - 12 = 0$

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

$\tan x = -4$ OR $\tan x = -3$

$x = \arctan(-4)$ OR $x = \arctan(3)$

Wait! Book answers suggest if it isn't clean, just leave it as an inverse trig expression



arctan(-4) is this one.

Make sure you capture the other!

127 §2.3 #s 63–73, 87–88

63 cnt'd

~~arctan(-4)~~, arctan(-4) + π, arctan(3), arctan(3) + π

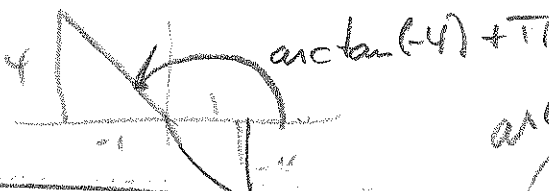
Not quite!

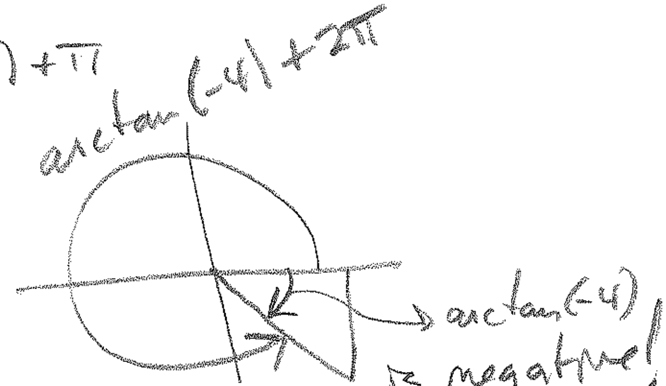
Wait! arctan(-4) is <u>Not</u> in [0, 2π]

Recall, range of arctan(x) is $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

Still, our picture is good. We just need to tweak the answer to get 'em all in [0, 2π]

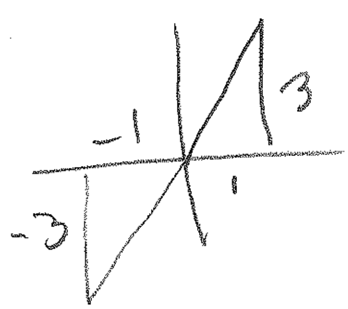
* arctan(-4) + π, arctan(-4) + 2π





$$\boxed{\begin{array}{l} \arctan(-4) + \pi, \\ \arctan(-4) + 2\pi \\ \arctan(3) \\ \arctan(3) + \pi \end{array}}$$

Final Answer



arctan(3) <u>is</u> in [0, 2π]

122 §2.3 #s 65-73, 87-8

(65) $\sec^2 x - 6\tan x = -4$

$\tan^2 x + 1 - 6\tan x + 4 = 0$

$\tan^2 x - 6\tan x + 5 = 0$

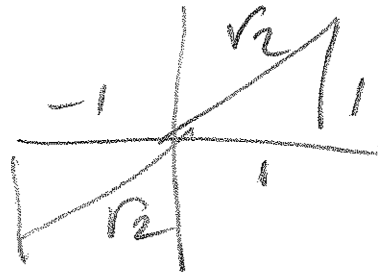
$(u-5)(u-1) = 0$

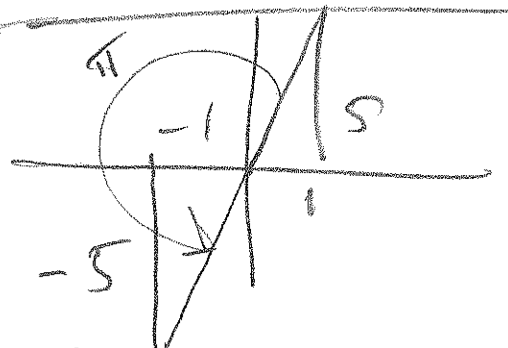
$\tan x = 5$

$\boxed{\begin{array}{l} x = \arctan(5) \\ x = \arctan(5) + \pi \end{array}}$

$\tan x = 1$

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





(67) $2\sin^2 x + 5\cos x = 4$

$2 - 2\cos^2 x + 5\cos x - 4 = 0$

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

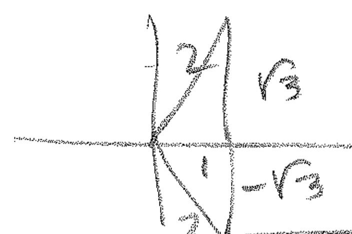
$2u^2 - 5u + 2 = 0$

$(2u - 1)(u - 2) = 0$

$2\cos x = 1$

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

$\boxed{\begin{array}{c} \cos x = 2 \\ \text{Nuvah!} \end{array}}$



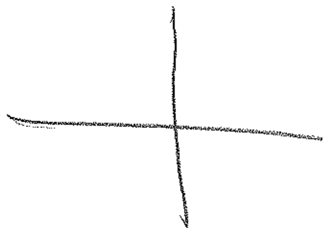
$\boxed{x = \frac{\pi}{3}, \frac{5\pi}{3}}$

122 §2.3 #s 69-73, 87-8

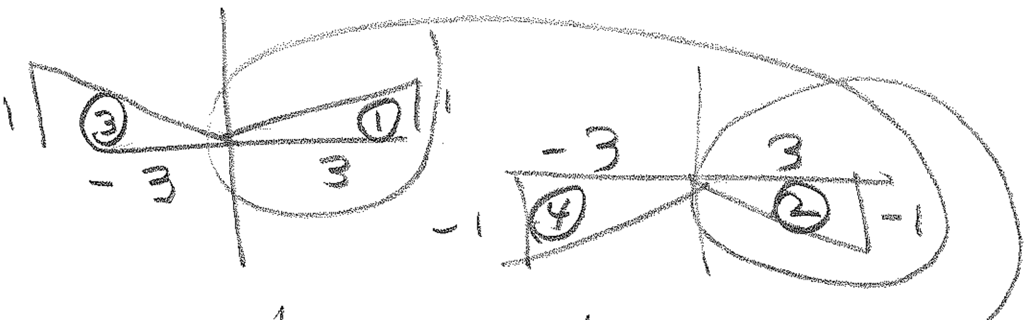
69 $\cot^2 x - 9 = 0$

We didn't do much with $\cot^{-1}(x)$. We could work with it, or just turn this into an equivalent equation involving $\arctan(x) = \tan^{-1}(x)$

$\cot x = \pm 3$



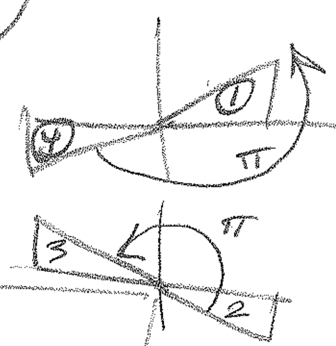
$\tan x = \pm \frac{1}{3}$



arctan x sees these 2's

Add π to 1 & get 4

Add π to 2 & get 3



So:
$$\boxed{x = \arctan\left(\tfrac{1}{3}\right),\ \arctan\left(\tfrac{1}{3}\right) + \pi,\ \arctan\left(-\tfrac{1}{3}\right),\ \arctan\left(-\tfrac{1}{3}\right) + \pi}$$

Your answer may look different, but still be correct, e.g., arccot(3) ...

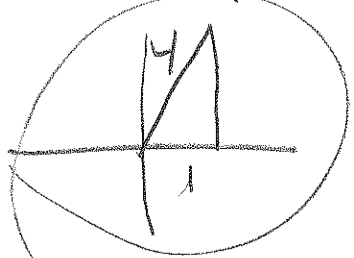
§2.3 #s 71-3, 87-8

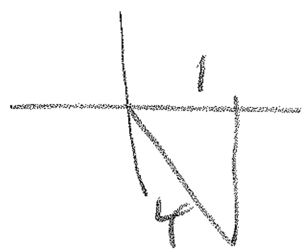
(71) $\sec^2 x - 4\sec x = 0$

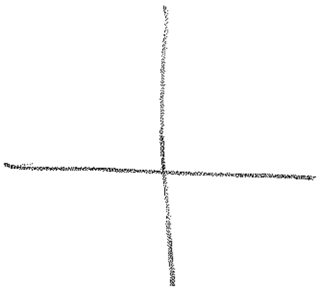
$\sec x(\sec x - 4) = 0$

$\sec x = 0$ Nevah!

$\sec x = 4$





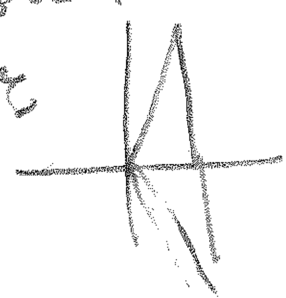


arcsec(x) sees only this one. Think back to the restriction we made on cosine in order to get this.

Heck, just turn it into a cosine question

$\sec x = 4 \iff \cos x = \frac{1}{4}$ Ahhh

So $x = \arccos\left(\frac{1}{4}\right), -\arccos\left(\frac{1}{4}\right)$, since we have this picture for the two's



122 §2.3 #s 73, 87-8

73

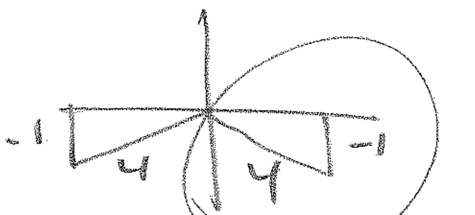
$$\csc^2 x + 3\csc x - 4 = 0$$

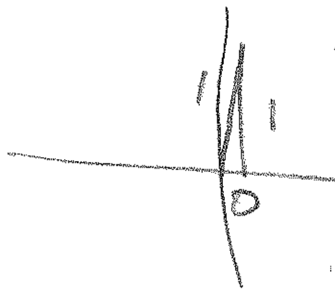
$$u^2 + 3u - 4 = 0$$

$$(u+4)(u-1) = 0$$

$\csc x = -4$ $\qquad$ $\csc x = 1$

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



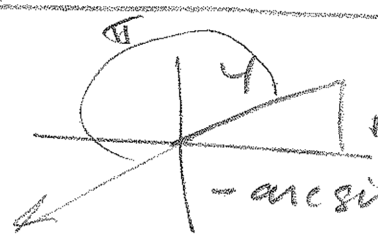


$\boxed{x = \frac{\pi}{2}}$

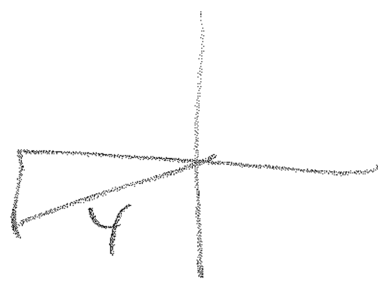
This is the one arcsin sees

$$\boxed{x = \arcsin\left(-\tfrac{1}{4}\right),\ -\arcsin\left(-\tfrac{1}{4}\right) + \pi}$$

$\arcsin\left(-\frac{1}{4}\right)$



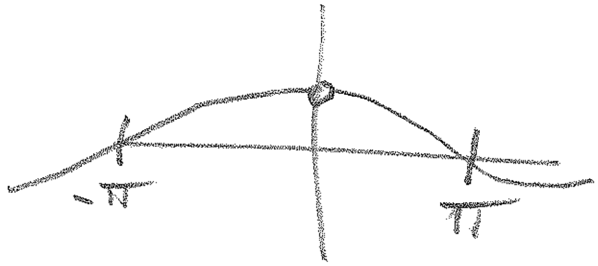
$-\arcsin\left(-\frac{1}{4}\right)$



$-\arcsin\left(-\frac{1}{4}\right) + \pi$

122 § 2.3 #s 87–8

87 $f(x) = \frac{\sin x}{x}$



(a) $\mathcal{D}(f) = \mathbb{R} \setminus \{0\}$

OR $= (-\infty, 0) \cup (0, \infty)$

OR $= \{x \mid x \neq 0\}$

(b) It's $\boxed{\text{symmetric about the } y\text{-axis}}$

because it's even $\frac{\text{odd}}{\text{odd}} = \frac{-}{-} = + =$ even

It has $\boxed{\text{horizontal asymptote } y = 0}$

Eventually $x \to \infty$, but $\sin x$ rattles around between ± 1

$$\frac{\sin x}{x} \xrightarrow{x \to \infty} \frac{\text{smallish}}{\text{Ginormous}} = 0$$

(c) as $x \to 0$,

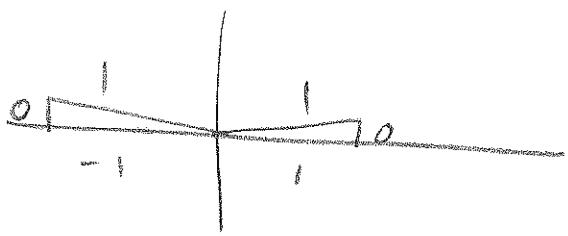
$\frac{\sin x}{x} \longrightarrow 1$, but you can never quite let $x = 0$!

122 §2.3 #s 87-8

(d) How many solutions does $\frac{\sin x}{x} = 0$ have in the interval $[-8, 8]$?

$\frac{\sin x}{x} = 0 \Longrightarrow \sin x = 0$ So, as many solutions as $\sin x = 0$ has in $[-8, 8]$

$x = n\pi$ $n = 0, \pm 1, \pm 2,$



when $n = \pm 3$, we get $|\pm 3\pi| > |9| > |8|$

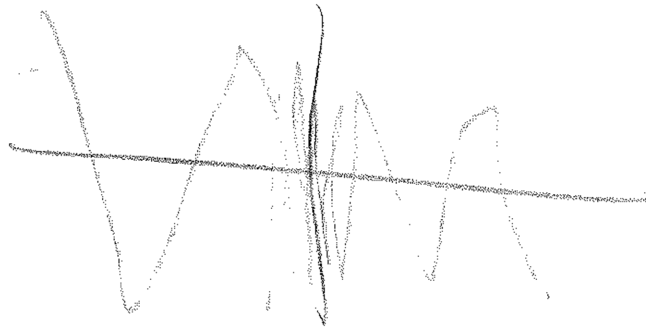
$\boxed{\text{So there are 5 solutions}}$

$\boxed{x = 0, \pm\pi, \pm 2\pi}$

122 §2.3 #88

88 $f(x) = \cos\left(\frac{1}{x}\right)$

Hard to graph.



(a) Its Domain is

$\boxed{(0, \infty)} = \{x \mid x > 0\}$

EVEN !

(b) It's $\boxed{\text{symmetric about the y-axis.}}$

It has $\boxed{\text{horizontal asymptote } y=1}$

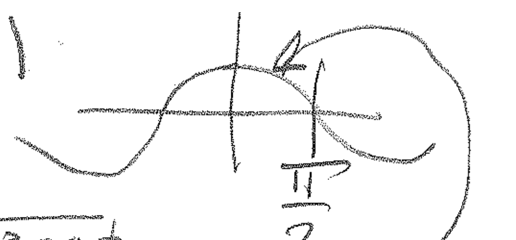
as $x \longrightarrow \infty$, $\frac{1}{x} \longrightarrow 0$ and so $\cos\left(\frac{1}{x}\right) \longrightarrow 1$.

(c) As $x \longrightarrow 0^+$ or $x \longrightarrow 0^-$, it basically oscillates an infinite # of times !

(d) $\cos\left(\frac{1}{x}\right) = 0$ has a greatest solution

$\cos\left(\frac{1}{x}\right) = 0$ has an infinite # of solutions

$\cos(x)$

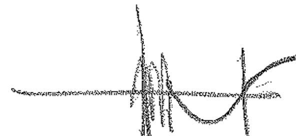


$\frac{\pi}{2}$

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

Max solution

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



$\frac{2}{\pi}$

This part of $\cos\left(\frac{1}{x}\right)$ is

this part of $\cos(x)$