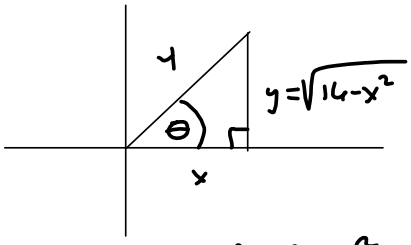
S1.7 #33

$\tan(\theta) = \tan(\arccos(\frac{x}{4})) \stackrel{?}{=} \frac{\sqrt{16-x^2}}{x}$



Pythagorus says $y = \sqrt{4^2 - x^2}$

Now $\tan\theta = \frac{\sqrt{16-x^2}}{x}$

$x^2 + y^2 = 4^2$

$y^2 = 4^2 - x^2$

$y = \pm\sqrt{16-x^2} \rightsquigarrow y = \sqrt{16-x^2}$

§1.6 Inverse Trig Functions

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

$\sin^{-15}(x) = (\sin(x))^{-15} = \frac{1}{\sin^{15}(x)} = \frac{1}{(\sin(x))^{15}}$

$\sin^{-1}(x) = \frac{1}{\sin(x)}$ NO!

NO!

They mean "angle whose sine is x."

" " $\arcsin(x)$, NOT $\frac{1}{\sin(x)}$

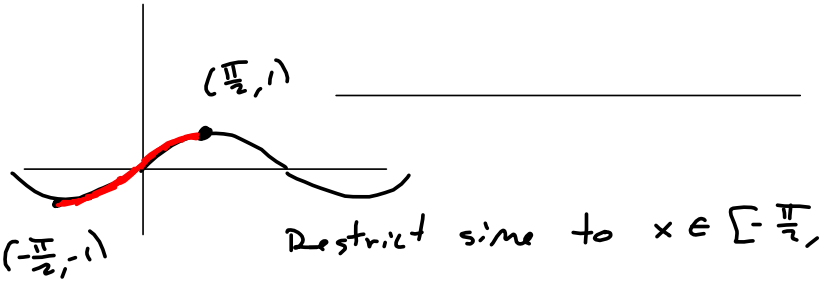
"$\sin^{-1}(x)$" is the inverse of sine with respect to function composition operation!

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

$\sin^{-1}(\sin(x)) = x$, not "1."

→ If the domain is right!

Trig functions aren't 1-to-1, so we have to restrict their domains.

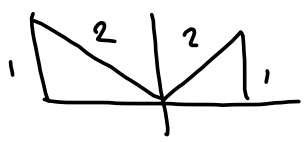


Restrict sine to $x \in [-\frac{\pi}{2}, \frac{\pi}{2}]$

Domain = $\mathbb{D}$

Range = $\mathbb{R}$

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



2 solns between 0 & 2π

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

$$\arcsin\left(\frac{1}{2}\right)$$

In degrees mode: $= 30^\circ$

This only gives the unique solution to $\sin(x) = \frac{1}{2}$ where $x \in [-90^\circ, 90^\circ]$.

Your job is to interpret.

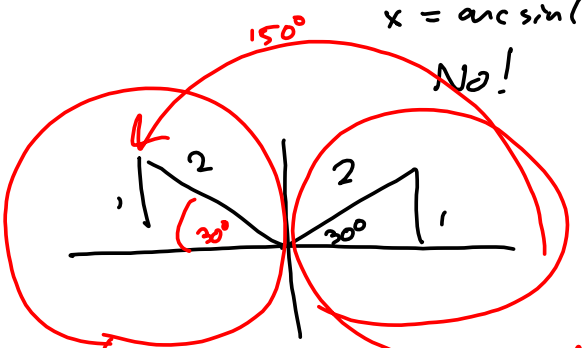
I know $x > 90^\circ$ of $\sin(x) = \frac{1}{2}$

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

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

$x = \arcsin(\frac{1}{2}) = 30^\circ$?!

No!



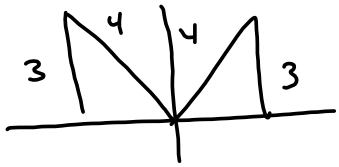
Calculator sees this.

We want this!

So it must be $180^\circ - 30^\circ = 150^\circ$

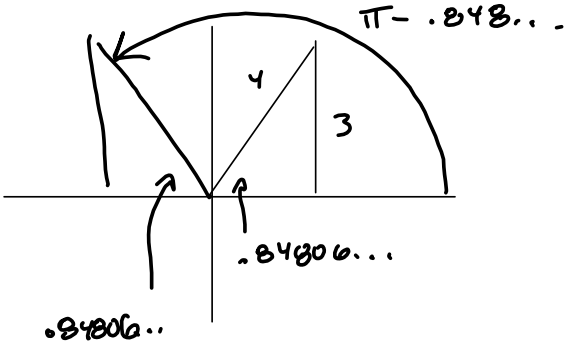
$\sin(x) = \frac{3}{4}$

$\arcsin(x) \approx 48.5903778907^\circ$



Find all sol'ns between 0 & 2π.

$(48.5903778907^\circ)\left(\frac{\pi}{180^\circ}\right) \approx 0.848062078981$

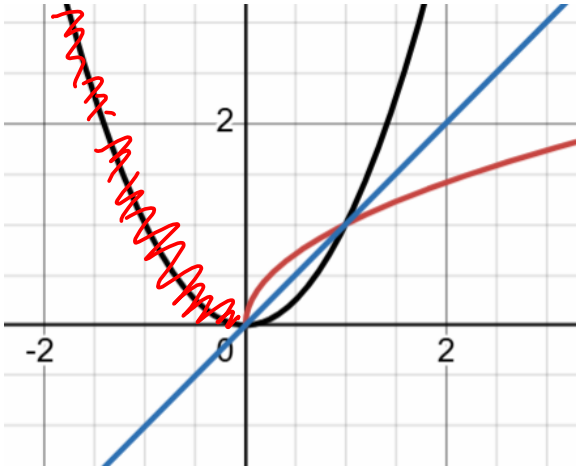


$\pi - .848... \approx 2.29353057461$

So, $x \approx .848062$ or 2.29353

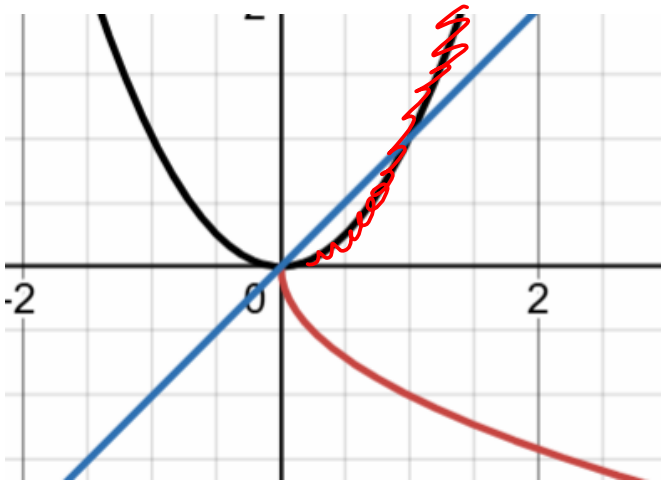
or $x \in \{.848062, 2.27353\}$ (approx.)

The graph of the inverse function is the graph of the original function reflected across the ine $y = x$.

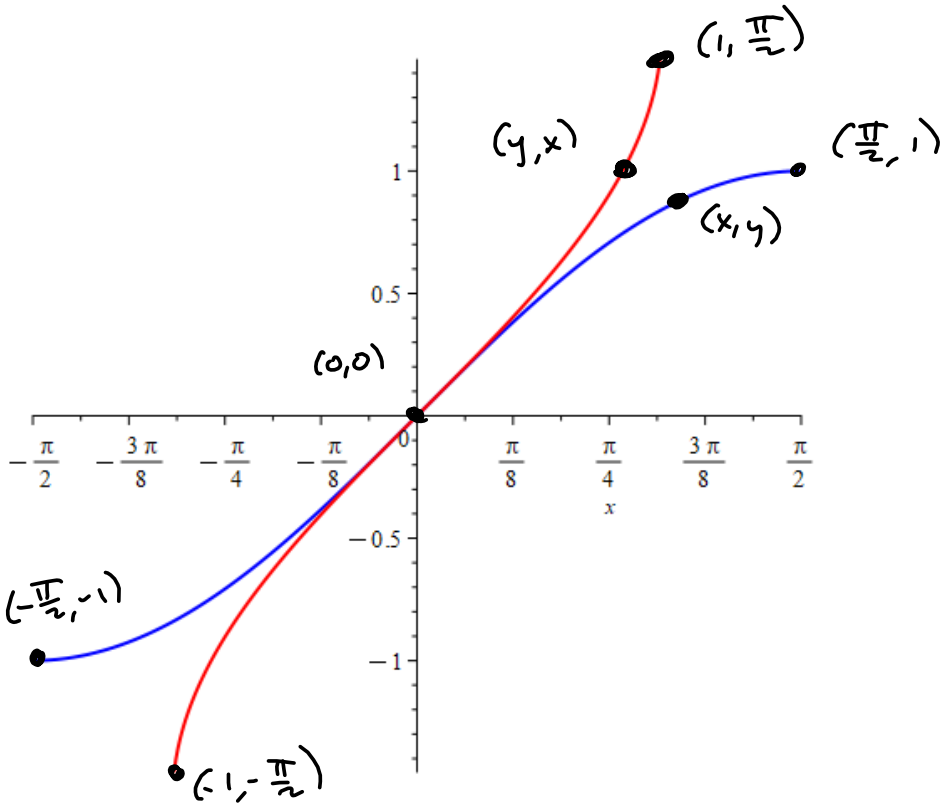


we have to restrict $f(x) = x^2$ to $x \in [0, \infty)$
Then $g(x) = f^{-1}(x) = \sqrt{x}$ is a function.

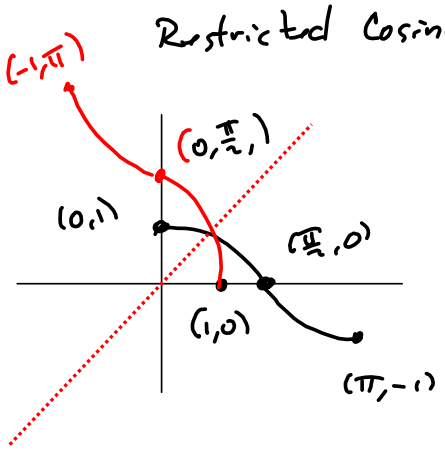
We can also make $f(x) = x^2$ 1-to-1 by restricting x to $(-\infty, 0]$. Then $y = -\sqrt{x}$ is the inverse!



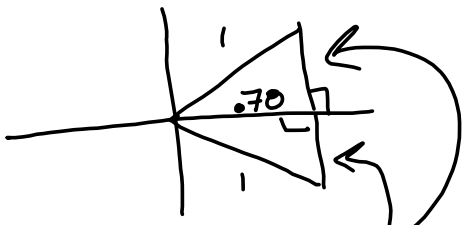
Restricted sine: AND arcsin(x):
BLUE RED



Restricted Cosine . Arccos(x) in Rad

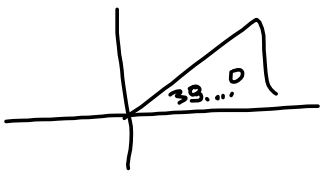


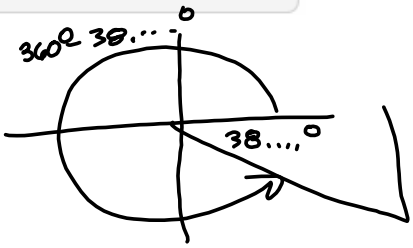
Solve cos(x) = .78



Calculator says

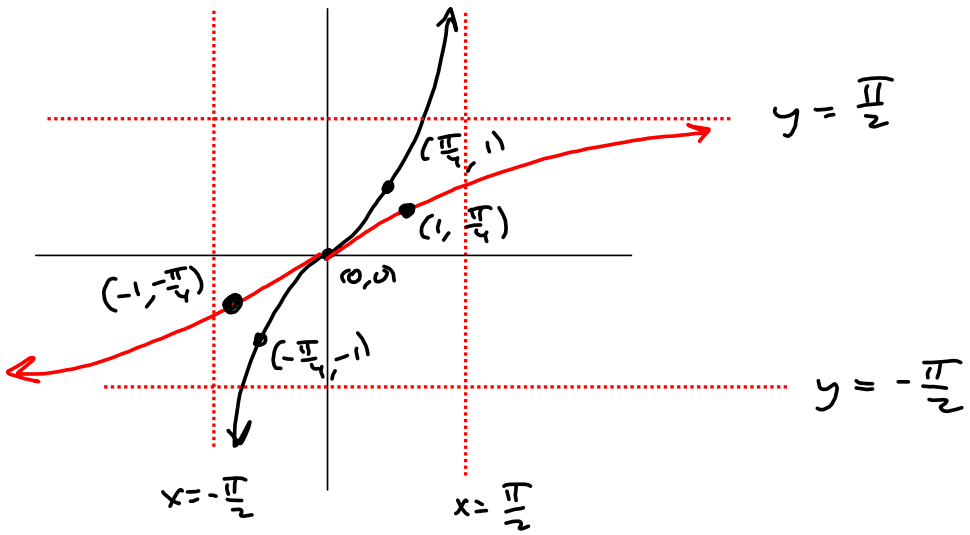
$$\arccos(.78) \approx 38.7394245979^\circ$$

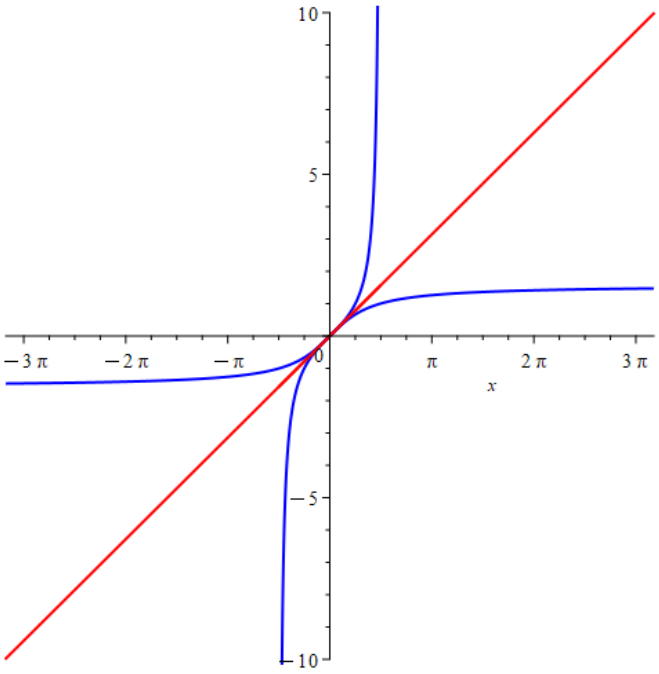


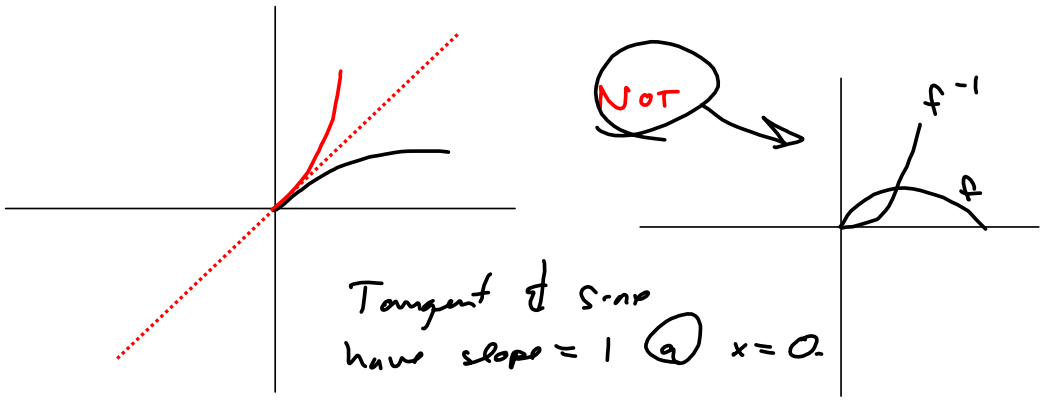


$360° - 38...° \approx 321.260575402°$

EZ to convert to radians or work with radians


$y = \frac{\pi}{2}$
$(\frac{\pi}{4}, 1)$
$(1, \frac{\pi}{4})$
$(0,0)$
$(-1, -\frac{\pi}{4})$
$(-\frac{\pi}{4}, -1)$
$y = -\frac{\pi}{2}$
$x = -\frac{\pi}{2}$
$x = \frac{\pi}{2}$


10
5
−5
−10
−3 π
−2 π
−π
0
π
2 π
3 π
x


NOT
f^{-1}
f
Tangent to sine
have slope = 1 @ x = 0.

§1.8 #22

Frequency is 256 vibrations (cycles) per second

0^0 wavelength = period = $\frac{1}{256}$

Want $\sin(\omega t)$ to have a period of $\frac{1}{256}$ sec.

Want $\omega t = 2\pi$ when $t = \frac{1}{256}$

$\left(\frac{1}{256}\right)\omega = 2\pi \Rightarrow$

$\omega = \frac{2\pi}{\left(\frac{1}{256}\right)} = 512\pi$

$y = 2\sin(512\pi t)$