inverse trig func

Recall:

A func has an inverse if it's 1:1 ($1 y \to 1 x$)

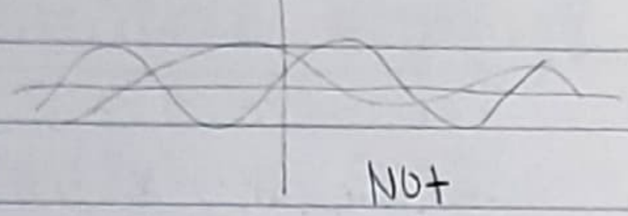
$y = f(x)$

$x = f^{-1}(y)$ ⟶ inverse func of y

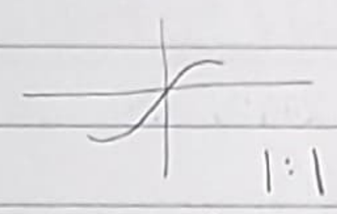
$y = x^2$ and $x = \sqrt{y}$

inverse

$\sin(x)$ and $\cos(x)$ are <u>not</u> 1:1



vs



$(-1, 1)$

$(-\pi/2, \frac{\pi}{2})$

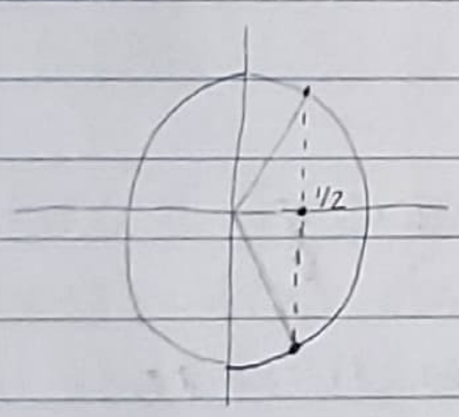
$\sin^{-1} x$ or $\arcsin(x)$

↳ defined $[-1, 1]$

inverse trig cont...

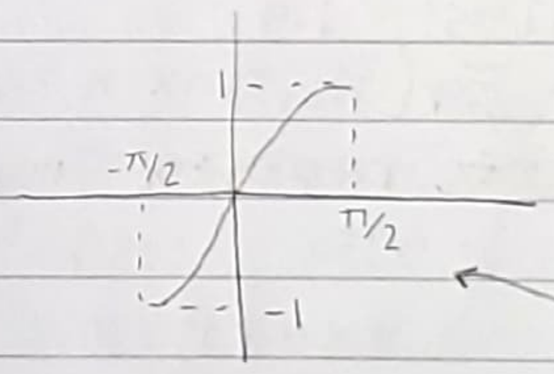
16 May 2023

If $\cos\theta = 1/2$, what's θ? ⟶ why we need inverses



$\cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$

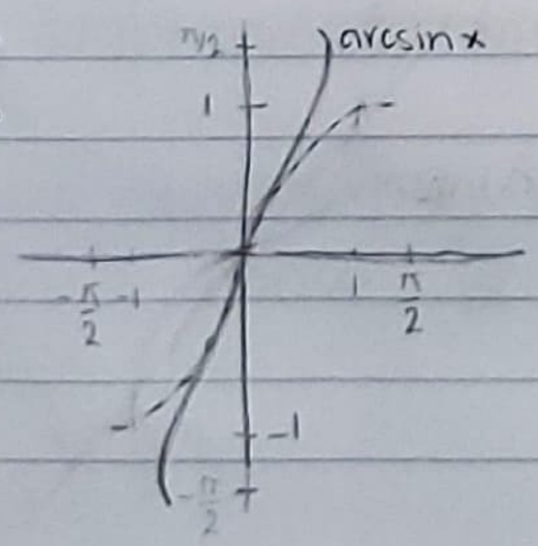
$\cos\left(-\frac{\pi}{3}\right) = \frac{1}{2}$



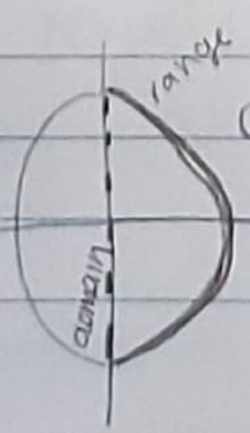
arcsin x is the inverse of sinx

- arcsin(x)
  - has a domain of $[-1, 1]$
  - has a range of $[-\pi/2, \frac{\pi}{2}]$

} opposite of $\sin(x)$ (restricted)



$\sin^{-1}$ is an increasing function



arcsin only takes values from the right side of the unit circle

D: $[-1,1]$ R: $[-\pi/2, \pi/2]$

ex

a) $\arcsin(1) = \boxed{\frac{\pi}{2}}$

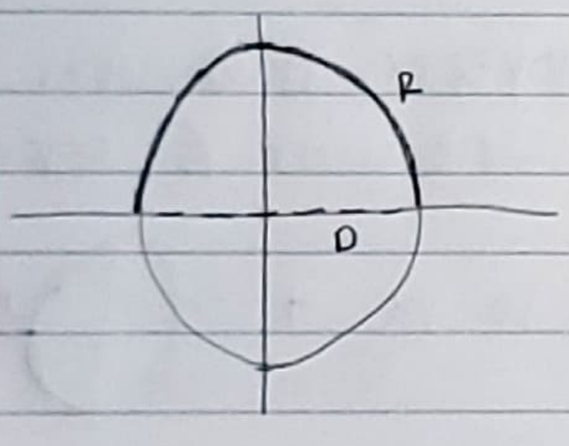
b) $\arcsin(0) = \boxed{0}$, π is outside range

c) $\arcsin(1/2) = \boxed{\frac{\pi}{6}}$, $\frac{5\pi}{6}$ is out of range

d) $\arcsin(\sqrt{2}/2) = \boxed{\frac{\pi}{4}}$

e) $\arcsin(-\sqrt{3}/2) = \sin(-\pi/3) = -\sqrt{3}/2 = \boxed{-\pi/3}$

Other inverses



arccos

D: $[-1, 1]$

R: $[0, \pi]$

$\arccos(-1/2) = \frac{2\pi}{3}$

$\arccos(1) = 0$

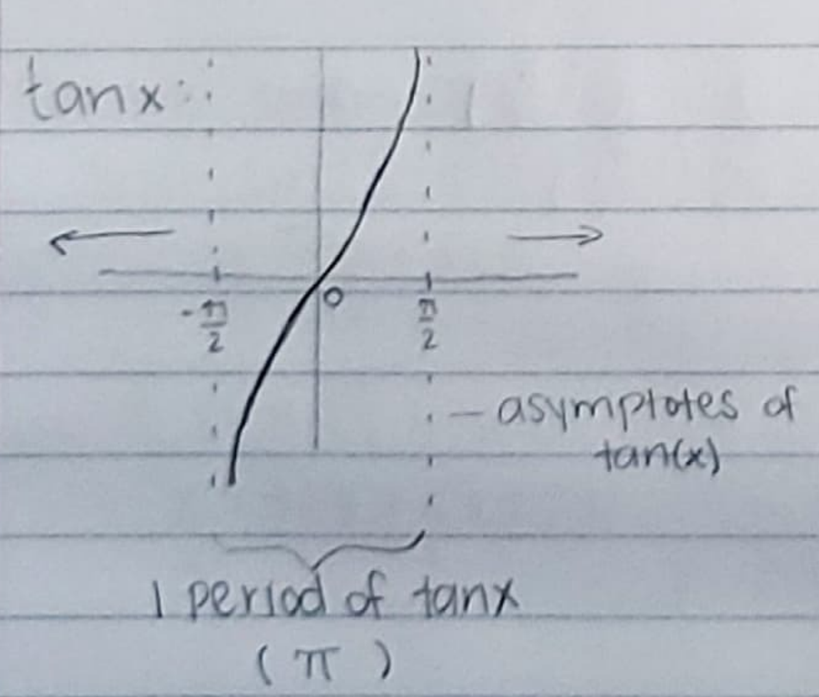
$\arccos(0) = \pi/2$

$\arccos(-1) = \pi$

Solving equations

18 may 2023

- Recall:
  - $\sin x$, $\cos x$, $\sec x$, $\csc x$, are periodic with period 2π
  - $\tan x$, $\cot x$ are periodic with period π



As $x \to \frac{\pi}{2}^-$, $\tan(x) \to \infty$

$x \to -\frac{\pi}{2}^+$, $\tan(x) \to -\infty$

and $\tan(0) = 0$

and $\tan(x)$ is increasing from $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

★ $\arctan(x)$ is the inverse of $\tan(x)$ ★

- D: $(-\infty, \infty)$
- R: $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$