

Good morning! Please have paper out for notes.

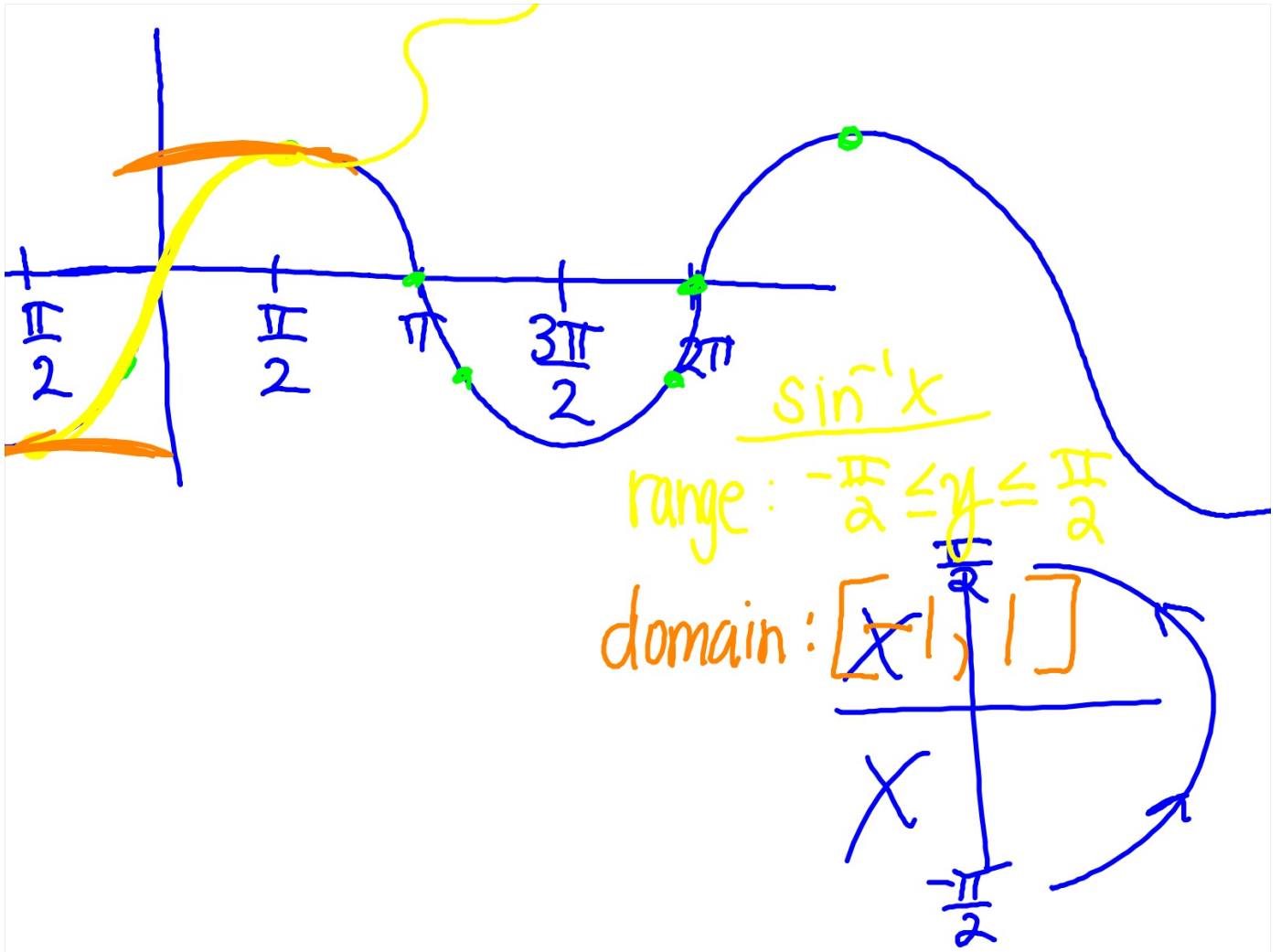
## 4.7 Inverse Trig

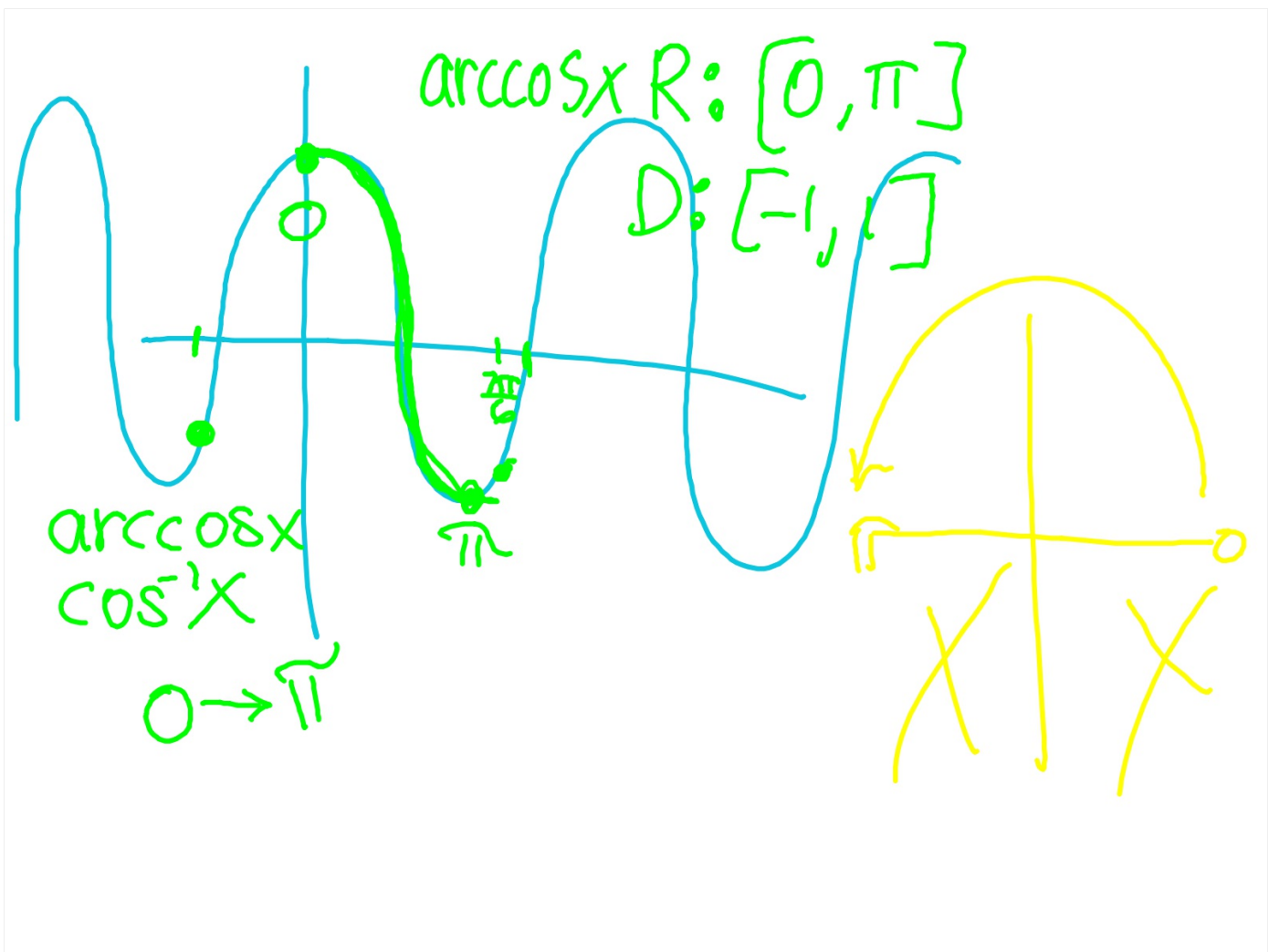
• Answer is an angle value

$\sin^{-1} x$		$\arcsin x$
$\cos^{-1} x$		$\arccos x$
$\tan^{-1} x$		$\arctan x$

$$\sin 30^\circ = \frac{1}{2}$$

$$\arcsin \frac{1}{2} = \frac{\cancel{30^\circ}}{6}$$

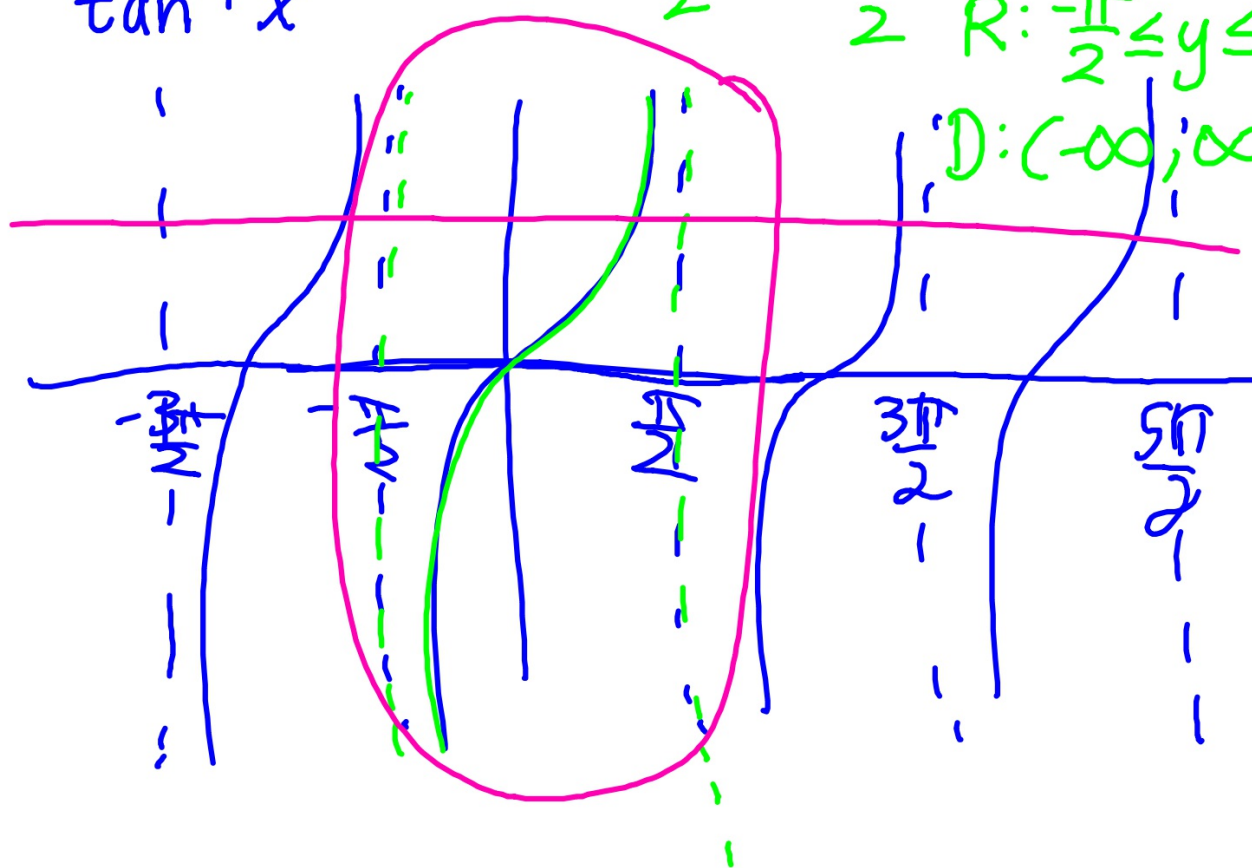




$\arctan x$   
 $\tan^{-1} x$

$\rightarrow -\frac{\pi}{2} \rightarrow \frac{\pi}{2}$

$\frac{\arctan x}{2}$   
 $R: -\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$   
 $D: (-\infty; \infty)$



★ For arcsinx/arccosx  $\rightarrow x \in [-1, 1]$

negative  $\leftarrow$  arccosx

arcsinx  
arccosx  
arctanx } positive

arctanx  
arcsinx } negative

$0 \neq \pi$

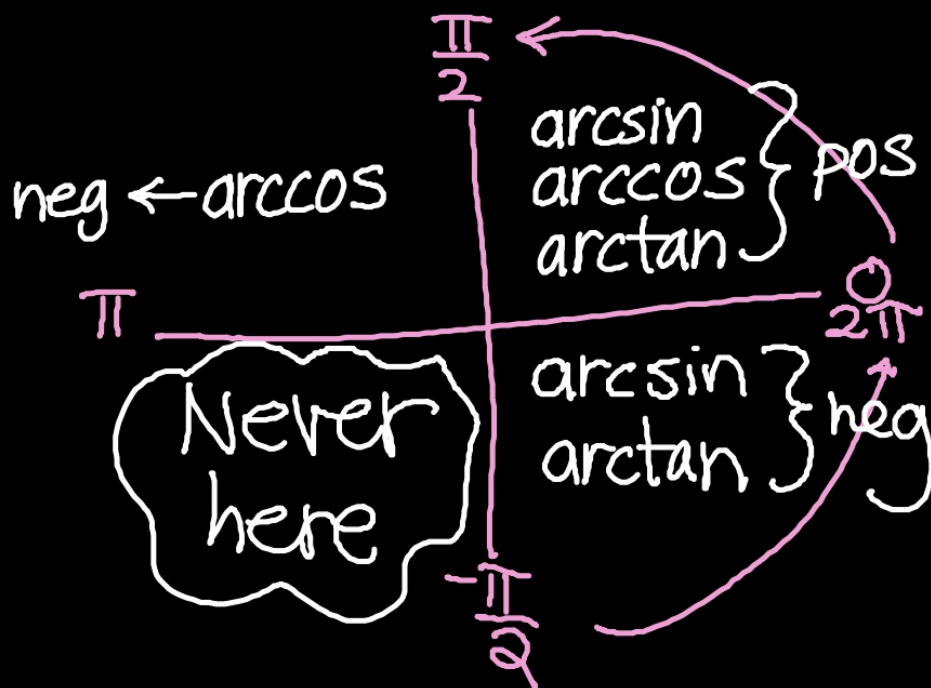
$-\frac{\pi}{6}$

$-\frac{\pi}{4}$

$-\frac{\pi}{3}$

★ arctanx has no restriction on  $x$

<u>Notation</u>	<u>Domain</u>	<u>Range</u>	<u>Q</u>
$\sin^{-1}\theta / \arcsin\theta$	$-1 \leq \theta \leq 1$	$-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$	I&IV
$\cos^{-1}\theta / \arccos\theta$	$-1 \leq \theta \leq 1$	$0 \leq y \leq \pi$	I&II
$\tan^{-1}\theta / \arctan\theta$	all #'s	$-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$	I&IV



Ex Simplify

1. ✓ size of value against domain  
- if o.k. goto step 2  
- if not o.k. write "d.n.e."
2. answer w/ an  $\angle$  from the appropriate quad. w/ appropriate name

A.  $\arcsin \frac{1}{2}$

find an  $\angle$  in QI/QIV with a y-value of  $\frac{1}{2}$

$$\frac{\pi}{6}$$

B.  $\arccos^{-\frac{\sqrt{3}}{2}}$

$$\frac{5\pi}{6}$$

C.  $\arctan 1$

$$\frac{\pi}{4}$$

What  $\angle$  in QI or QIV has a  $\frac{y}{x}$  of 1

D.  $\sin^{-1}(-\frac{\sqrt{2}}{2})$

$$-\frac{\pi}{4}$$

E.  $\cos^{-1}(\pi)$

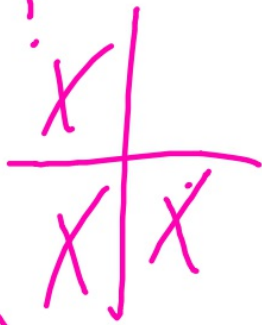
d.n.e.



Simplify

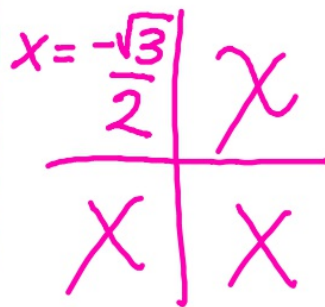
1.  $\arcsin\left(\frac{1}{2}\right)$

What  $\angle$  in QI or QIV has a y-coord of  $\frac{1}{2}$ ?



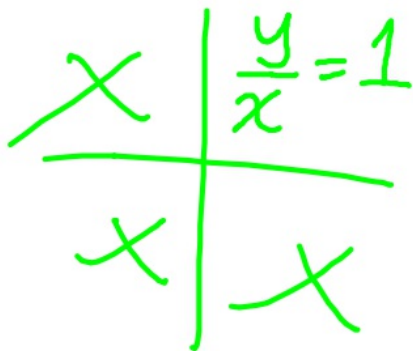
$\frac{\pi}{6}$

2.  $\arccos\left(-\frac{\sqrt{3}}{2}\right)$



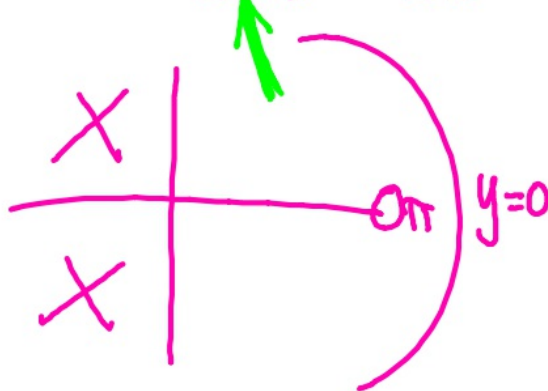
$\frac{5\pi}{6}$

3.  $\arctan 1$



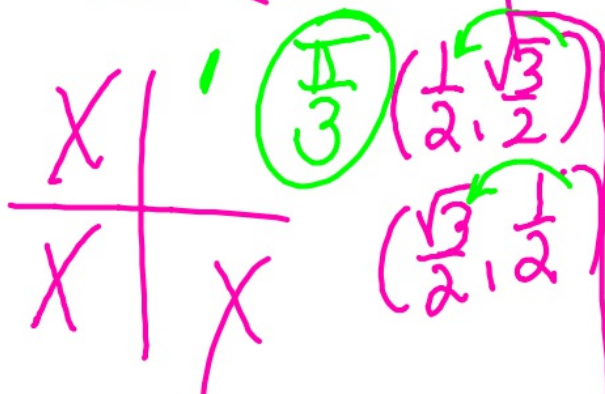
$\frac{\pi}{4}$   
 $\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}$

4.  $\sin^{-1}(0) = 0$  or  $\pi$



5.

$\tan^{-1}(\sqrt{3})$

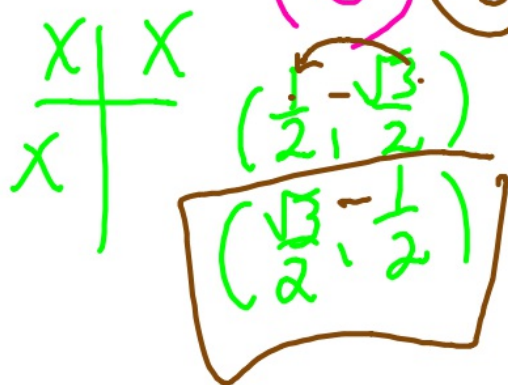


$\frac{\pi}{3}$   
 $(\frac{1}{\sqrt{3}}, \frac{1}{2})$   
 $(\frac{\sqrt{3}}{2}, \frac{1}{2})$

6.  $\sin^{-1}(\pi)$

$\therefore$  dne

7.  $\tan^{-1}(-\frac{\sqrt{3}}{3})$



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

## Composite Inverse Functions

↳ ~ a func. inside a func.

1. if match cancel  
&  $\checkmark$  size & Quad.
2. if no match...
  - A. build  $\Delta$  from inside piece
  - B. use pythag to get 3<sup>rd</sup> side
  - C. ans from  $\Delta$  using outer piece.

## Composite Inverse Trig. Fun!

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

2.  $\arctan(\tan \frac{\pi}{4})$   
 $\frac{\pi}{4}$

3.  $\cos^{-1}(\cos \frac{2\pi}{3})$   
 $\frac{2\pi}{3}$

4.  $\sin^{-1}(\sin \frac{11\pi}{6})$

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5.  $\sin(\arcsin 7)$

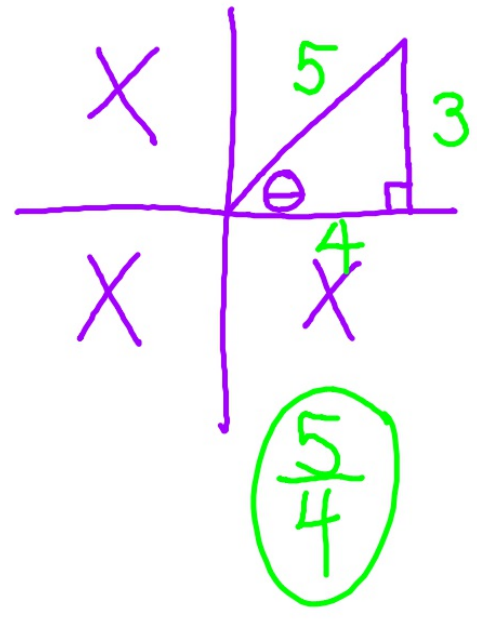
(dne)

$-\frac{\pi}{6}$

6.  ~~$\sec(\arcsin \frac{3}{5})$~~

actual  
Q

build  $\Delta$



1. ✓ size #
2. build  $\Delta$  in correct Quadrant
3. use pythag to get 3rd side
4. ans. outer Q

Ex Simplify

A.  $\sin(\arcsin \frac{1}{2})$

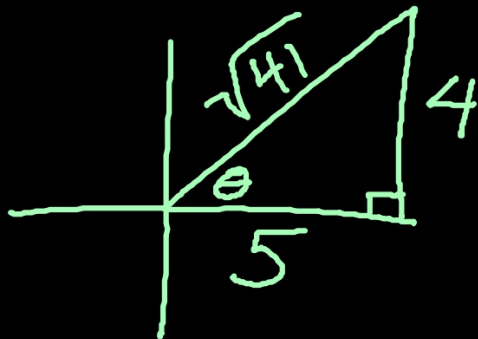
$\frac{1}{2}$

B.  $\sin^{-1}(\sin \frac{5\pi}{3})$

~~$\frac{5\pi}{3}$~~   $\frac{-\pi}{3}$

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

$$C. \sec(\text{arctan } \frac{4}{5}) = \frac{\sqrt{41}}{5}$$



$$5^2 + 4^2 = h^2$$

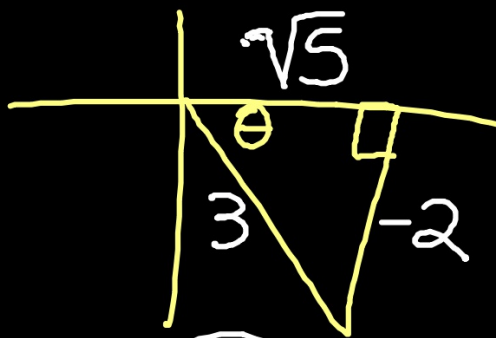
$$25 + 16 = h^2$$

$$h = \sqrt{41}$$

Soh  
CAH  
TOA

D.  $\cos(\arcsin \frac{-2}{3})$

$\frac{o}{h}$



$\frac{\sqrt{5}}{3}$