## Obj3: Inverse Cosine Function

The inverse cosine function, denoted by, y = cos xor y = anccos x takes a number x in the interval [-1,1] and gives us an angle in [0,T] whose

Cosine is equal to X

E.g.  $anccos(0) = \frac{\pi}{2}$ 

arccos (1) = 0

 $anccon\left(\frac{\sqrt{2}}{2}\right) = \frac{\pi}{4}$ 

 $anccos \left(-\frac{7}{7}\right) = \frac{50}{3}$ 

 $\operatorname{anccos}\left(-\frac{\sqrt{3}}{2}\right) = \frac{5\pi}{6}$ 

 $anccon(-1) = \pi$ 

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

 $ancon\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{6}$ 

 $axcos\left(-\frac{\sqrt{2}}{2}\right) = \frac{3\pi}{4}$ 

Graph of y = arccorx.

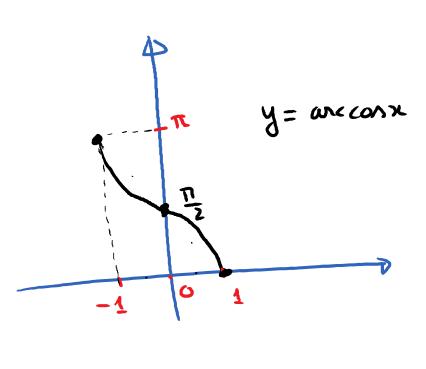
Domain: [-1,1]. Range: [0,T]

X y = ancconx

-1 TT

-12 37
4 TD

12 2 4



Obj 4: Inverse Tangent Function.

The inverse tangent function, denoted by,  $y = \tan x$  or  $y = \arctan x$  taken a number x in  $(-\infty, \infty)$  and gives un an angle in  $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$  whose tangent in equal to  $x = \arctan x$ .

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E.g. 
$$anctan(0) = 0$$
  
 $anctan(1) = \frac{\pi}{L}$ 

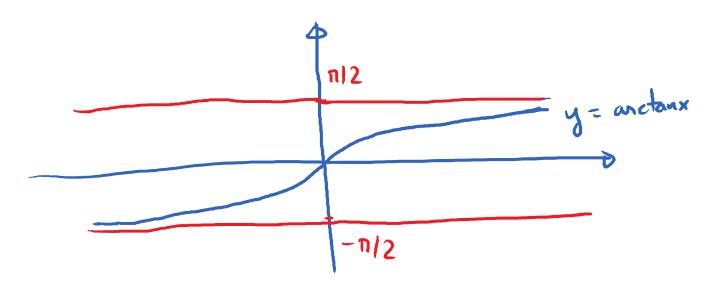
$$\arctan\left(-1\right) = -\frac{\pi}{4}.$$

$$\arctan\left(\frac{\sqrt{3}}{3}\right) = \frac{\pi}{6}$$

ardem  $\left(-\frac{\sqrt{3}}{3}\right) = -\frac{\pi}{6}$ .

Graph of y = arctan x

Domain: 
$$(-\infty, \infty)$$
; Range:  $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ 



Obj 5: Simplify expressions that involve both inverse trig and trig functions.

E.g. Evaluate 
$$sin\left(tan^{-1}\left(\frac{3}{2}\right)\right)$$
.

Since  $tan^{-1}(\frac{3}{2})$  gives us an angle whose tangent is  $\frac{3}{2}$ , we will denote that angle by  $\Theta$ 

$$\theta = \tan^{-1}\left(\frac{3}{2}\right)$$

So, 
$$tan(\Theta) = \frac{3}{2}$$

Since  $\tan^{-1}$  returns an angle in  $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ ,  $\Theta$  must

be in Quadrant I on  $\overline{\mathbb{IV}}$ . Since  $ten(\Theta) = \frac{3}{2} > 0$ ,

O must be in quadrant I.

Goal of the problem: Find sin(6).

$$\frac{3}{2} + 3^2 = \sqrt{2^2 + 3^2}$$

$$Sin(\Theta) = \frac{6pp}{hyp} = \frac{3}{\sqrt{13}} = \frac{3\sqrt{13}}{13}$$

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Ex. Evaluate 
$$\tan \left( \cos^{-1} \left( -\frac{5}{13} \right) \right)$$

Let 
$$\theta = \cos^{-1}\left(-\frac{5}{13}\right)$$
.

Since cost return an angle in [0, 17], & must be in quadrant I on II.

Since  $con(\Theta) = -\frac{5}{13}$ , quadrant II.

(poal: 
$$t ind tan(\Theta)$$
.

(13)<sup>2</sup> - (-5)<sup>2</sup> = 12.

$$\frac{13}{7}$$
  $\frac{13}{7}$   $\frac{12}{7} = -\frac{12}{5}$ 

 $cos\left(arctan\sqrt{3}\right)+\left(arctan\frac{1}{3}\right)$ Evaluate

$$= \cos \left( \frac{\pi}{3} + \Theta \right)$$

$$\cos\left(\frac{\pi}{3} + \Theta\right) = \cos\frac{\pi}{3} \cdot \cos\Theta - \sin\frac{\pi}{3} \cdot \sin\Theta$$

$$= \frac{1}{2} \cos\Theta - \frac{\sqrt{3}}{2} \sin\Theta$$

We need cose and sint.

$$\Theta = \arctan \frac{1}{3}$$
. So  $\Theta$  is in quadrant I on IV.

Since 
$$ten \Theta = \frac{1}{3}$$
,  $\Theta$  is in quadrant  $I$ .

$$\frac{1}{2} + 3^2 = \sqrt{10}$$

$$\cos \theta = \frac{3}{\sqrt{10}} = \frac{3\sqrt{10}}{10}$$

$$\sin \theta = \frac{1}{\sqrt{10}} = \frac{\sqrt{10}}{10}$$

$$\cos\left(\frac{n}{3} + 6\right) = \frac{1}{2} \cdot \frac{3\sqrt{10}}{10} - \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{10}}{10}$$

$$= \frac{3\sqrt{10}}{20} - \frac{\sqrt{30}}{20} = \frac{3\sqrt{10} - \sqrt{30}}{20}$$