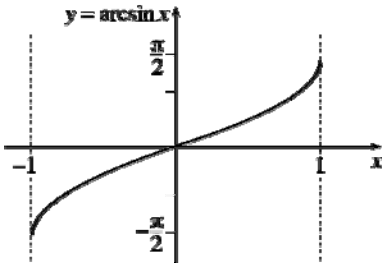
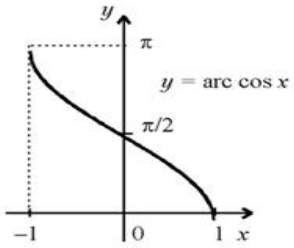
Section 5.4b
Inverse Trigonometric Functions and Models

Recall the following graphs from Section 5.4a.

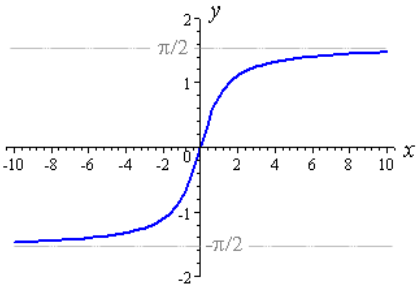
$f(x) = \sin^{-1}(x) = \arcsin(x)$



$f(x) = \cos^{-1}(x) = \arccos(x)$

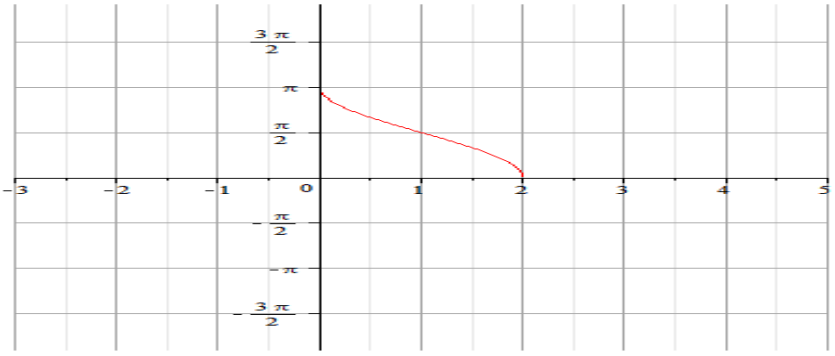


$f(x) = \tan^{-1}(x) = \arctan(x)$.



We can apply simply transformation rules to these types of graphs too.

Example 1: Give an equation which could be used to represent the given graph.



a. $f(x) = \tan^{-1}(x-1)$ b. $f(x) = \sin^{-1}(x+1)$ c. $f(x) = \cos^{-1}(x-1)$

d. $f(x) = \sin^{-1}(x-1)$ e. $f(x) = \cos^{-1}(x+1)$

Example 2: Which of the following points is on the graph of $y = \tan\left(\frac{x}{2}\right) - 2$?

a. $\left(-\frac{\pi}{2}, -1\right)$ Substitute:

b. $\left(-\frac{\pi}{2}, -2\right)$ Substitute:

c. $\left(-\frac{\pi}{2}, -3\right)$ Substitute:

Example 3: Which of the following points is on the graph of $y = \arcsin(x+2) - \pi$?

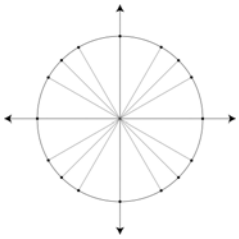
a. $(0, 0)$ Substitute:

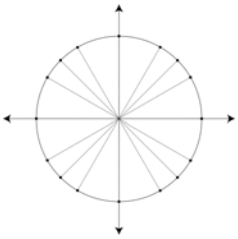
b. $\left(-3, -\frac{3\pi}{2}\right)$ Substitute:

c. $(-4, 0)$ Substitute:

Example 4: Evaluate each of the following.

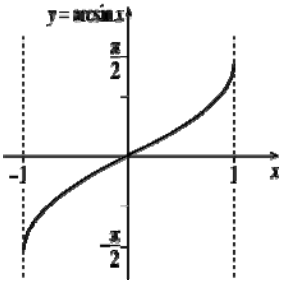
a. $\arccos\left(\cos\left(\pi\right)\right)$



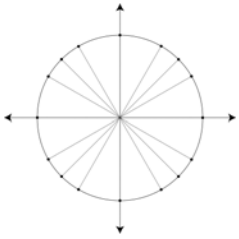


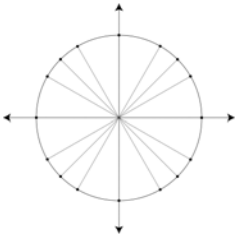
b. $\sin(\arcsin(-2))$.

Recall:

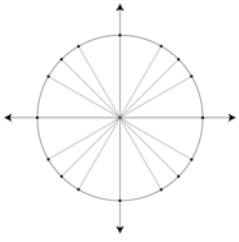


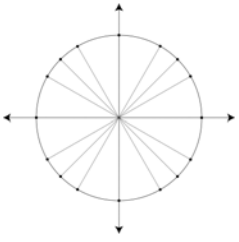
c. $\arctan\left(\tan\left(\frac{2\pi}{3}\right)\right)$



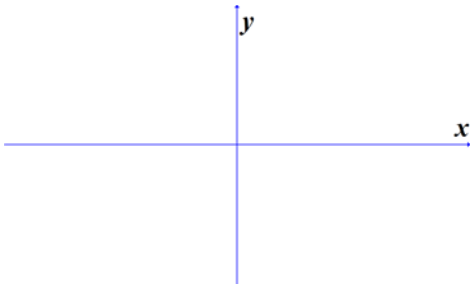


d. Evaluate $\arccos\left(\cos\left(\frac{7\pi}{6}\right)\right)$.

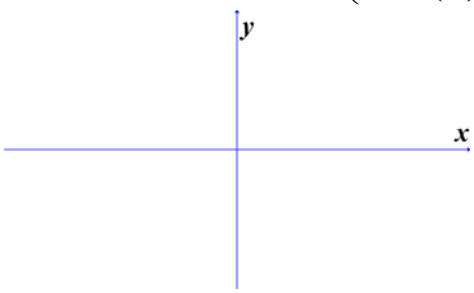




Example 5: Evaluate $\cos\left(\sin^{-1}\left(\frac{3}{4}\right)\right)$



Example 6: Evaluate $\cos\left(\tan^{-1}\left(\frac{5}{4}\right)\right)$.



Models

As we know, trigonometric functions repeat their behavior. Breathing normally, brain waves during deep sleep are just a couple of examples that can be described using a sine function.

Example 7: The current *I*, in amperes, flowing through an ac (alternating current) circuit at time *t* is modeled by $I = 210\sin\left(40\pi t - \frac{\pi}{3}\right)$ where $t \geq 0$. Find its:

a. amplitude. A =

b. period. $\frac{2\pi}{B}$ =

c. horizontal shift. $\frac{C}{B}$ =

d. maximum value.