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Study Guide

Trigonometric Inverses and Their Graphs

The inverses of the Sine, Cosine, and Tangent functions are called Arcsine, Arccosine, and Arctangent, respectively. The capital letters are used to represent the functions with restricted domains. The graphs of Arcsine, Arccosine, and Arctangent are defined as follows.

Arcsine Function	Given $y = \text{Sin } x$, the inverse Sine function is defined by the equation $y = \text{Sin}^{-1} x$ or $y = \text{Arcsin } x$.
Arccosine Function	Given $y = \text{Cos } x$, the inverse Cosine function is defined by the equation $y = \text{Cos}^{-1} x$ or $y = \text{Arccos } x$.
Arctangent Function	Given $y = \text{Tan } x$, the inverse Tangent function is defined by the equation $y = \text{Tan}^{-1} x$ or $y = \text{Arctan } x$.

Example 1 **Write the equation for the inverse of $y = \text{Arcsin } 2x$. Then graph the function and its inverse.**

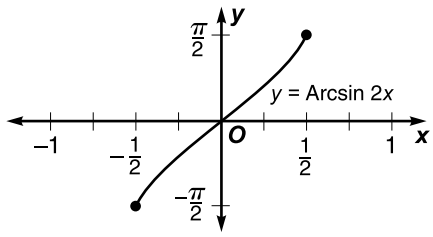
$y = \text{Arcsin } 2x$

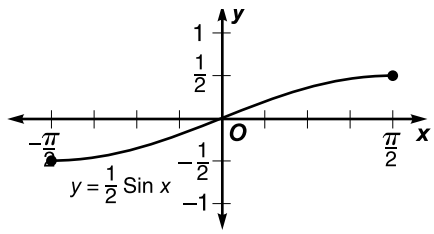
$x = \text{Arcsin } 2y$ *Exchange x and y.*

$\text{Sin } x = 2y$ *Definition of Arcsin function*

$\frac{1}{2}\text{Sin } x = y$ *Divide each side by 2.*

Now graph the functions.





Example 2 **Find each value.**

a. $\text{Arctan}\left(-\frac{\sqrt{3}}{3}\right)$

Let $\theta = \text{Arctan}\left(-\frac{\sqrt{3}}{3}\right)$. *Arctan $\left(-\frac{\sqrt{3}}{3}\right)$ means that angle whose tan is $-\frac{\sqrt{3}}{3}$.*

$\text{Tan } \theta = -\frac{\sqrt{3}}{3}$ *Definition of Arctan function*

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

b. $\text{Cos}^{-1}\left(\sin \frac{\pi}{2}\right)$

If $y = \sin \frac{\pi}{2}$, then $y = 1$.

$\text{Cos}^{-1}\left(\sin \frac{\pi}{2}\right) = \text{Cos}^{-1} 1$ *Replace $\sin \frac{\pi}{2}$ with 1.*

$= 0$