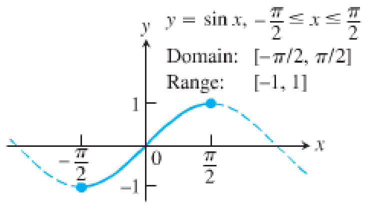
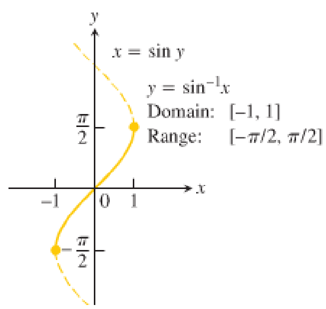
3.9 Inverse Trigonometric Functions

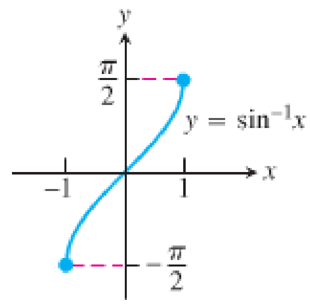
$f(x) = \arcsin x \quad \text{or} \quad f(x) = \sin^{-1} x$





Domain: $-1 \le x \le 1$

Range: $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$

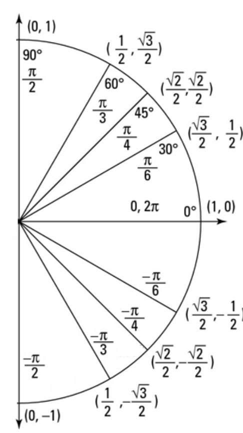


Definition : $y = \arcsin x$ is the number in $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ for which $\sin y = x$

Find $\arcsin\left(\frac{\sqrt{3}}{2}\right)$.

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

Find $\arcsin(-1)$.



What is the derivative of $y = \arcsin x$?

from before:

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

$$\left(f^{-1}\right)'(x) = \frac{1}{f'\left(f^{-1}(x)\right)}$$

$f'(x) =$ $\quad \left(f^{-1}\right)'(x) = ?$

$\left(f^{-1}\right)'(x) =$

since $\cos x = \sqrt{1-\sin^2 x}$, we have

$\left(f^{-1}\right)'(x) =$

this is better written as

$\left(f^{-1}\right)'(x) =$

remember $\sin(\arcsin x) = x$

$\left(f^{-1}\right)'(x) =$

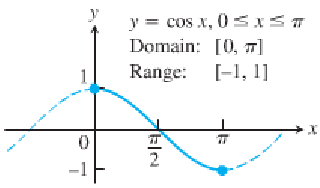
$y = \arcsin x$

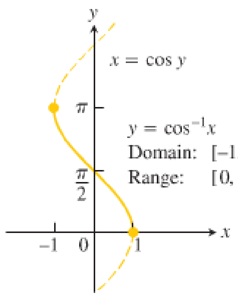
$y' =$

Let $y = \arcsin(3x)$.

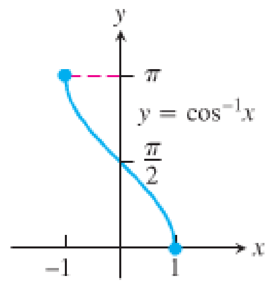
Find $y'\left(\frac{\sqrt{3}}{6}\right)$.

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





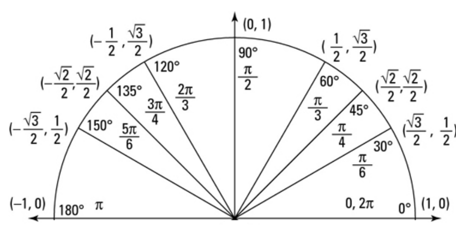
Domain: $-1 \le x \le 1$
Range: $0 \le y \le \pi$



Math 103 – Rimmer
3.9Inverse Trig.
Functions

Definition : $y = \arccos x$ is the number in $[0, \pi]$ for which $\cos y = x$

Find $\arccos\left(\frac{-1}{2}\right)$.



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

Find $\arccos(-1)$.

What is the derivative of $y = \arccos x$?

from before:

$$\left(f^{-1}\right)'(x) = \frac{1}{f'\left(f^{-1}(x)\right)}$$

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

$f'(x) =$ $\qquad \left(f^{-1}\right)'(x) = ?$

$\left(f^{-1}\right)'(x) =$

since $\sin x = \sqrt{1-\cos^2 x}$, we have

$\left(f^{-1}\right)'(x) =$

this is better written as

$\left(f^{-1}\right)'(x) =$

remember $\cos(\arccos x) = x$

$\left(f^{-1}\right)'(x) =$

$y = \arccos x$

$y' =$

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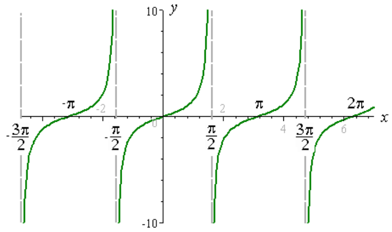
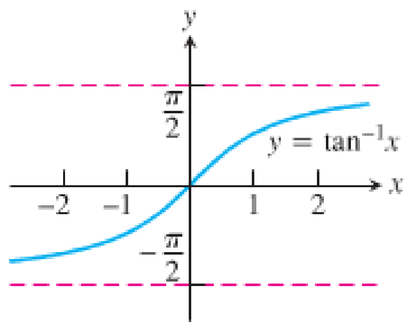
4. Let $f(x) = \arccos\left(\frac{1}{\sqrt{x}}\right)$. What is $f'(4)$?

A) $-\frac{\pi}{3}$ B) $-\frac{1}{8\sqrt{3}}$ C) $\frac{2}{\sqrt{3}}$ D) $-\frac{2}{\sqrt{3}}$ E) $\frac{1}{8\sqrt{3}}$ F) $\frac{\pi}{3}$ G) $\frac{\pi}{2}$ H) $\frac{\pi}{6}$

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



Domain: $-\infty < x < \infty$
Range: $-\frac{\pi}{2} < y < \frac{\pi}{2}$



$\lim\limits_{x\to-\infty} \arctan x =$

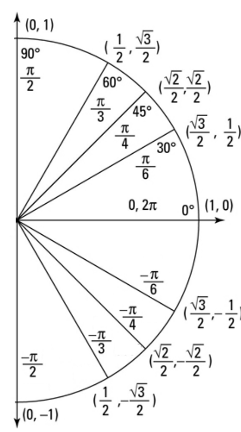
$\lim\limits_{x\to\infty} \arctan x =$

Definition : $y = \arctan x$ is the number in $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ for which $\tan y = x$

Find $\arctan(-1)$.

Find $\arctan(\sqrt{3})$.

Find $\arctan\left(\frac{-1}{\sqrt{3}}\right)$.



Math 103 – Rimmer
3.9Inverse Trig. Functions

What is the derivative of $y = \arctan x$?

from before:

$$\left(f^{-1}\right)'(x) = \frac{1}{f'\left(f^{-1}(x)\right)}$$

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

$f'(x) =$ $\qquad$ $\left(f^{-1}\right)'(x) = ?$

$\left(f^{-1}\right)'(x) =$ $\qquad$ since $\sec^2 x = 1 + \tan^2 x$, we have

$\left(f^{-1}\right)'(x) =$ $\qquad$ this is better written as

$\left(f^{-1}\right)'(x) =$ $\qquad$ remember $\tan(\arctan x) = x$

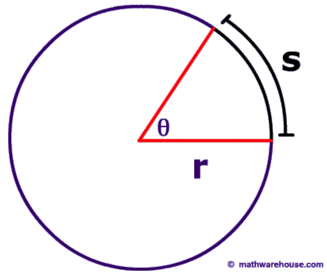
$\left(f^{-1}\right)'(x) =$

$$\boxed{\begin{gathered} y = \arctan x \\ y' = \frac{1}{1+x^2} \end{gathered}}$$

Math 103 – Rimmer
3.9Inverse Trig. Functions

Why is the word arc used?

arclentgh $s = r\theta$



On the unit circle $r = 1$,so $s = \theta$