$\arctan x = \tan^{-1}(x) \neq \frac{1}{\tan x} = \cot x$.

IB Pre HL Inverse Trigonometric Functions Name _____ key

What is inverse trigonometric?

If $\tan\theta = \frac{1}{\sqrt{3}}$ is given, θ is found by $\theta = \tan^{-1}(\frac{1}{\sqrt{3}})$. In order not to be confused by the inverse trig $\tan^{-1} x$ and the reciprocal trig $\frac{1}{\tan x}$, $\tan^{-1} x$ is also expressed $\arctan x$.

Since $\sin x$, $\cos x$, and $\tan x$ are all many to one functions, their domains must be restricted in order for them to have inverse functions.

$y = \sin x$ Range: $[-1, 1]$ Domain $(-\infty, \infty)$

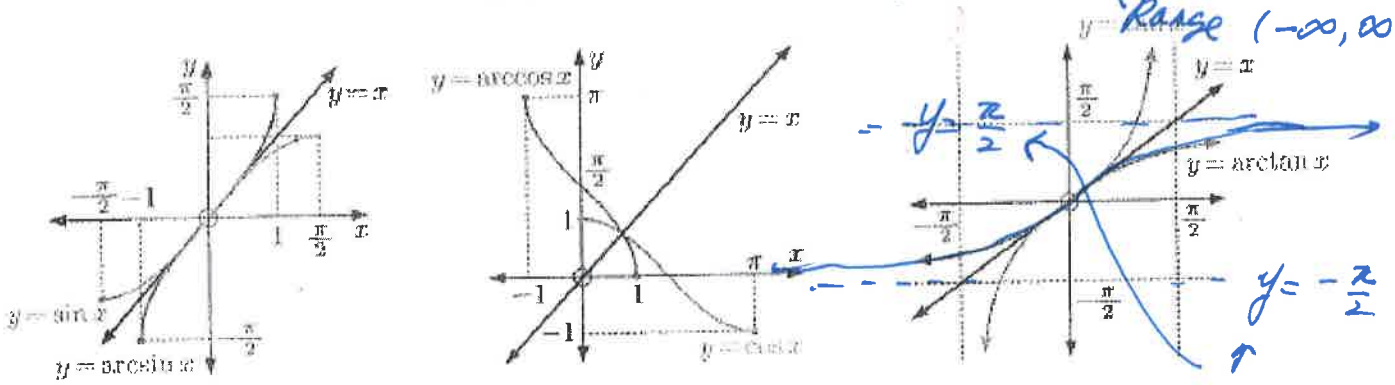
Functions	Invers functions	Definition and domain	Range
$y = \sin x$ $\Rightarrow x = \sin y$	$y = \arcsin x$ $(y = \sin^{-1} x)$	$x = \sin y \quad -1 \le x \le 1$	$-\frac{\pi}{2} \le y \le \frac{\pi}{2}$
$y = \cos x$	$y = \arccos x$ $(y = \cos^{-1} x)$	$x = \cos y \quad -1 \le x \le 1$	$0 \le y \le \pi$
$y = \tan x$	$y = \arctan x$ $(y = \tan^{-1} x)$	$x = \tan y \quad x \in R$	$-\frac{\pi}{2} \le y \le \frac{\pi}{2}$

$y = \tan x$ Domain $(-\infty, \infty)$

$\Leftrightarrow y = \tan^{-1} x$ $x \neq \frac{\pi}{2} + n\pi$

Range $(-\infty, \infty)$

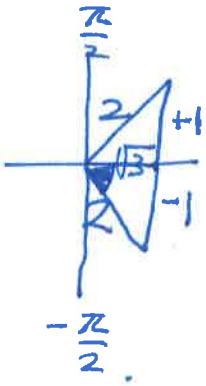
The graphs of these inverse functions.



Horizontal Asymptotes

Example 1) Find the exact value of $\arcsin(-\frac{1}{2})$.

$-\frac{\pi}{2} \le \arcsin x \le \frac{\pi}{2}$. $x = -30°$ OR $-\frac{\pi}{6}$.



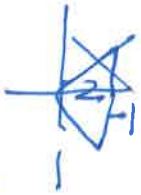
Example 2) Find the exact value of $\arctan(\cos\frac{2\pi}{3})$ $\Rightarrow \arctan(-\frac{1}{2}) = ?$

$\cos\frac{2\pi}{3} = -\frac{1}{2}$.

$-\frac{\pi}{2} \le \arctan x \le \frac{\pi}{2}$

$-.46$

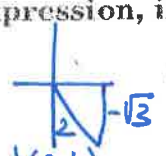
Must use a calculator.



Practice)

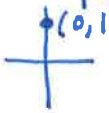
Find the exact value of each expression, if it exists.

5. $\arcsin^{-1}\left(-\frac{\sqrt{3}}{2}\right) = -\frac{\pi}{3}$



6. $\cos^{-1}\left(\cos\frac{\pi}{3}\right) = \frac{\pi}{3}$

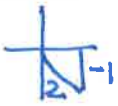
7. $\tan\left(-\frac{3\pi}{2}\right) = \frac{1}{0} = \text{und.}$



8. $\sin^{-1}\left(\cos\frac{\pi}{3}\right) = \sin^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{6}$

9. $\arctan\left(-\frac{\sqrt{3}}{3}\right) = \arctan\left(\frac{-1}{\sqrt{3}}\right) = -\frac{\pi}{3}$

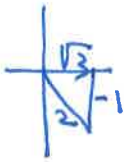
10. $\arcsin\left(-\frac{1}{2}\right) = -\frac{\pi}{6}$



11. $\tan\left(\sin^{-1}1 - \cos^{-1}\frac{1}{2}\right)$

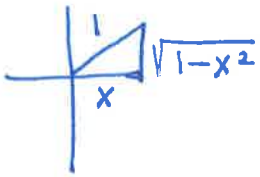
$\tan\left(\frac{\pi}{2} - \frac{\pi}{3}\right) = \tan\left(\frac{3\pi}{6} - \frac{2\pi}{6}\right) = \tan\left(\frac{\pi}{6}\right) = \frac{1}{\sqrt{3}}$

12. $\sin\left(\arctan -\frac{\sqrt{3}}{3}\right) = \sin\arctan\frac{-1}{\sqrt{3}} = -\frac{\pi}{6}$



Write each trigonometric expression as an algebraic expression of x.

14. $\sin(\arccos x) = \sqrt{1-x^2}$



15. $\tan(\sin^{-1}x) = \frac{x}{\sqrt{1-x^2}}$