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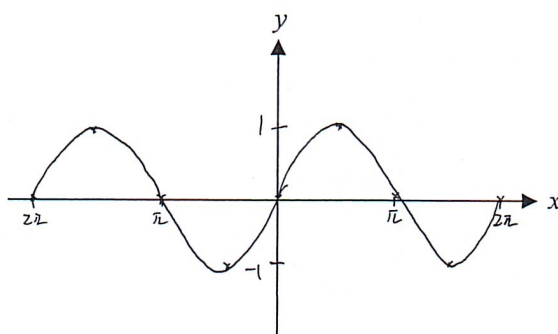
Class: 321

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MA304.5.5 – Inverse Trigonometric Functions

As trigonometric equations are periodic, it is not a bijective function unless the domain is restricted.

E1. The graph of the function $f(x) = \sin x$, $x \in \mathbb{R}$ is a periodic wave of amplitude 1 and a period of 360° .



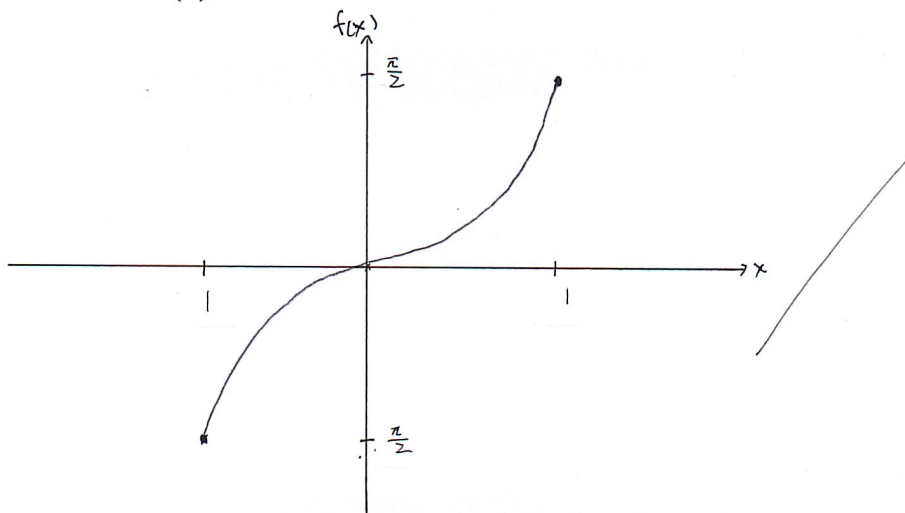
Since it is not one-to-one, a restriction of domain is to be done so that its inverse can exist. By convention, the domain restricted is $[-90^\circ, 90^\circ]$. The function

$$f : x \rightarrow \sin x, -90^\circ \leq x \leq 90^\circ$$

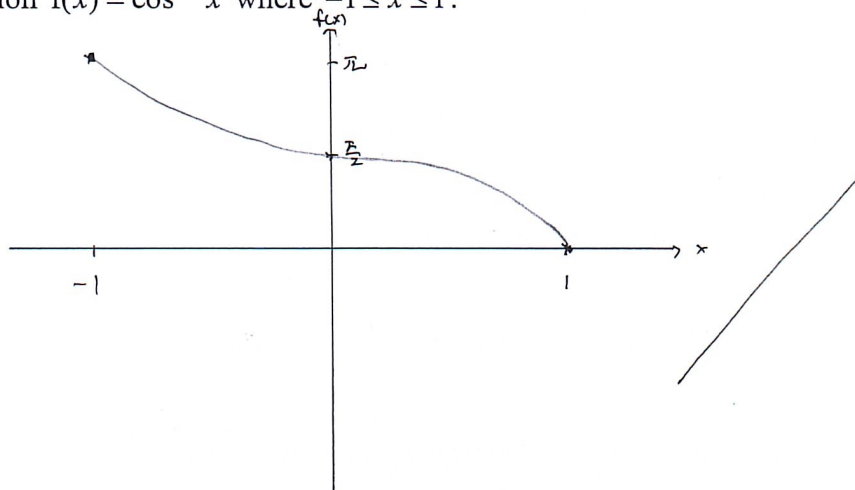
is thus a one-to-one function, and its inverse function can easily be found to be

$$f^{-1} : x \rightarrow \sin^{-1} x, -1 \leq x \leq 1$$

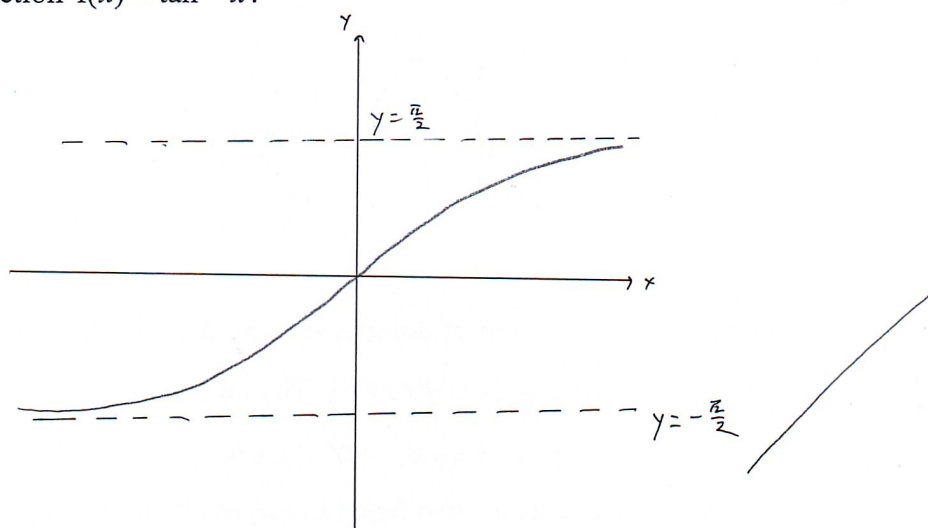
P1. Draw the function $f(x) = \sin^{-1} x$ where $-1 \leq x \leq 1$.



P2. Draw the function $f(x) = \cos^{-1} x$ where $-1 \leq x \leq 1$.



P3. Draw the function $f(x) = \tan^{-1} x$.



The **principal value** for each of the three inverse trigonometric functions $\sin^{-1} x$, $\cos^{-1} x$ and $\tan^{-1} x$ is defined as the angle within the following domains:

	x	Principal value
$\sin^{-1} x$	$-1 \leq x \leq 1$	$-90^\circ \leq \sin^{-1} x \leq 90^\circ$
$\cos^{-1} x$	$-1 \leq x \leq 1$	$0^\circ \leq \cos^{-1} x \leq 180^\circ$
$\tan^{-1} x$	$x \in \mathbb{R}$	$-90^\circ < \tan^{-1} x < 90^\circ$

This is also the same numerical value given by the scientific calculator when you wish to evaluate the angle for inverse trigonometric ratios.