Inverse Trigonometric Functions Encyclopedia Article

Inverse Trigonometric Functions

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Inverse Trigonometric Functions

Inverse trigonometric **functions** are the inverse of the different **trigonometric functions sine**, **cosine**, tangent, cotangent, secant, and cosecant. The inverse of a function is simply the reflection of that function about the line $x = y$ and for inverse trigonometric functions is expressed as $f^{-1}(x)$. The inverse trigonometric functions are expressed as $\sin^{-1}x$ (or arcsin x), $\cos^{-1}x$ (or arccos x), $\tan^{-1}x$ (or arctan x), $\cot^{-1}x$ (or arccot x), $\sec^{-1}x$ (or arcsec x), and $\csc^{-1}x$ (or arccsc x). The trigonometric functions are based on complex exponentials and so the inverse of such functions can be expressed in terms of the natural logarithmic function, ln. Although this is true it is much more practically useful to define the inverse functions in terms of side measurements of triangles as they relate to the angles in the **triangle** when solving geometric problems.

Inverse trigonometric functions are periodic since they are derived from trigonometric functions that are circular in nature. Since they are not one to one functions the **domain** must be restricted for each inverse trigonometric function just as in the case of the trigonometric functions. The restricted domains for each function are as follows:

- $\sin^{-1}x = y$ for -1 x 1 and for -/2 y /2
- $\cos^{-1}x = y$, for -1 x 1 and for 1 < y
- $\tan^{-1}x = y$, for any x and for -/2 < y < /2
- $\cot^{-1}x = y$, for any x and for 0 < y <
- $\sec^{-1}x = y$, for (x(1 and for 0 y < /2 or y < 3/2
- $\csc^{-1}x = y$, for (x(1 and for 0 < y /2 or < y 3/2.

The inverse trigonometric functions are examples of transcendental functions. Although these inverse functions are usually employed in problems that require finding angles from side measurements in triangles, when they are written in terms of natural logarithmic functions they are also useful as antiderivatives for a wide variety of functions. In this sense they are often utilized in solving **differential equations** that arise in mathematics, engineering and physics.