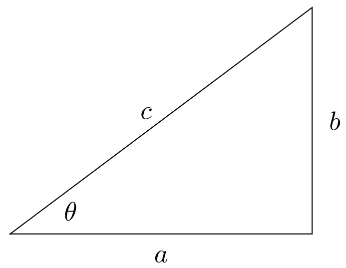
IB Analysis and Approaches HL2
Inverse Trigonometric Functions

Definition & Purpose

Triangle Example

Suppose we have a right triangle with an angle θ and sides of length a, b, and c as shown below.

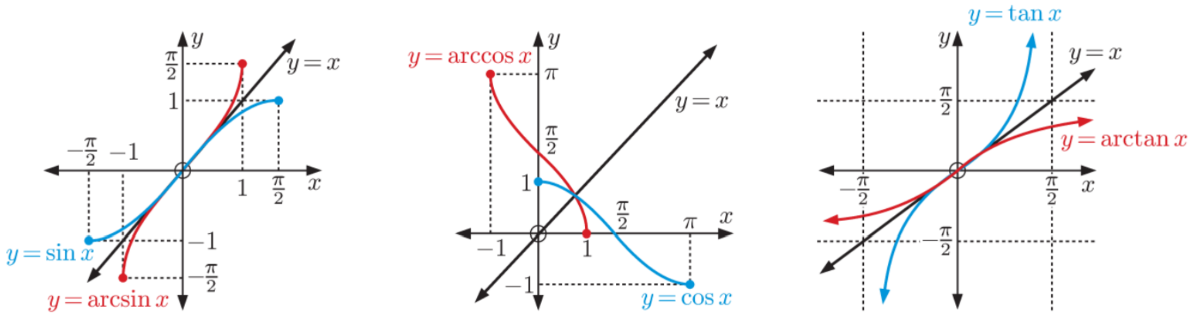


In regular trigonometry:

$$\sin(\theta) = \frac{b}{c},$$
$$\cos(\theta) = \frac{a}{c},$$
$$\tan(\theta) = \frac{b}{a}.$$

Trigonometric Function	Domain	Range
$\arcsin(x)$		
$\arccos(x)$		
$\arctan(x)$		

Domain and Range Visualization



Example Problems

1. **Find, where possible, the exact solutions of:**

   (a) $\arctan x = \frac{\pi}{6}$

   (b) $\arccos(x-1) = \frac{\pi}{4}$

   (c) $\arcsin x = \frac{\pi}{6}$

2. **Find the invariant point for the inverse transformation from:**

   (a) $y = \sin x$ to $y = \arcsin x$

   (b) $y = \tan x$ to $y = \arctan x$

Key Takeaways

Inverse Trigonometric Functions

- $\arcsin(x)$: Inverse of $\sin(x)$. Domain: $-1 \leq x \leq 1$, Range: $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$.
- $\arccos(x)$: Inverse of $\cos(x)$. Domain: $-1 \leq x \leq 1$, Range: $0 \leq y \leq \pi$.
- $\arctan(x)$: Inverse of $\tan(x)$. Domain: $-\infty < x < \infty$, Range: $-\frac{\pi}{2} < y < \frac{\pi}{2}$.