

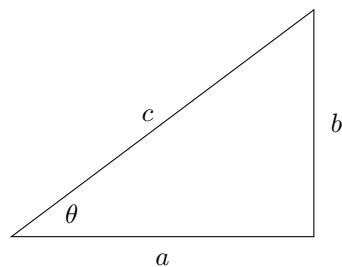
# IB Analysis and Approaches HL2

## Inverse Trigonometric Functions

### Definition & Purpose

### Triangle

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



In regular trigonometry:

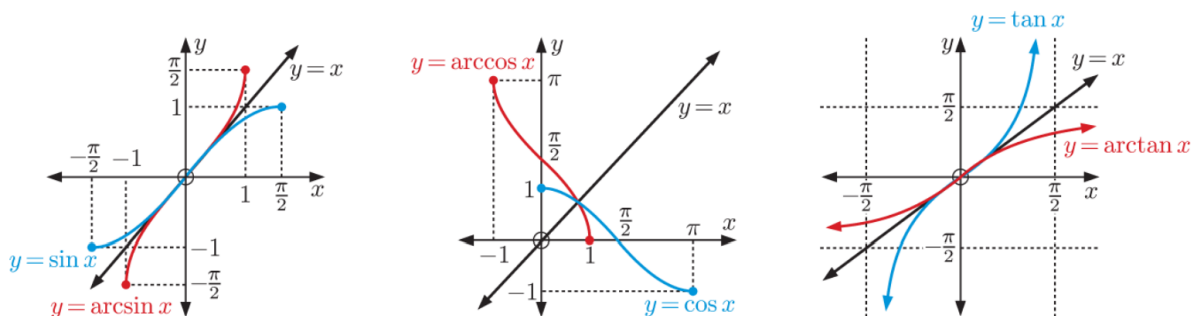
$$\sin(\theta) = \frac{b}{c},$$

$$\cos(\theta) = \frac{a}{c},$$

$$\tan(\theta) = \frac{b}{a}.$$

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

## Domain and Range Visualization



## Example Problems

1. **Satellite Communication:** A satellite orbits the Earth, and the angle between the line from the satellite to a ground station and the line from the satellite to the Earth's center is  $\arcsin\left(\frac{2}{3}\right)$ . If the distance from the satellite to the Earth's center is 10,000 km, what is the distance from the satellite to the ground station?

## 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:  $-\frac{\pi}{2} < y < \frac{\pi}{2}$ .