

## TRIGONOMETRIC FUNCTIONS

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### Lesson Description

In this lesson we:

- Draw sketch graphs of trigonometric functions on a given domain.
- Trigonometric graph interpretation



### Summary

#### Sine Function

$$y = a \sin\theta + q$$

- Period is  $360^\circ$
- The range will depend on the values of  $a$  &  $q$
- The value of  $a$  affects the amplitude of the graph.
  - for  $a > 1$  there is a vertical stretch and the amplitude increases
  - for  $0 < a < 1$  the amplitude decreases
  - for  $a < 0$  there is a reflection about the x axis
  - for  $-1 < a < 0$  the amplitude decreases and there is a reflection about the x-axis
  - for  $a < -1$  the amplitude increases and there is a reflection about the x-axis
- Changing values of  $q$  will move the graph vertically up or down

#### Cosine Function

$$y = a \cos\theta + q$$

- Period is  $360^\circ$
- The range will depend on the values of  $a$  &  $q$
- The value of  $a$  affects the amplitude of the graph.
  - for  $a > 1$  there is a vertical stretch and the amplitude increases
  - for  $0 < a < 1$  the amplitude decreases
  - for  $a < 0$  there is a reflection about the x axis
  - for  $-1 < a < 0$  the amplitude decreases and there is a reflection about the x-axis
  - for  $a < -1$  the amplitude increases and there is a reflection about the x-axis
- Changing values of  $q$  will move the graph vertically up or down

## Tangent Function

$$y = a \tan \theta + q$$

- Period is  $180^\circ$
- Asymptotes  $x=90$  and  $x=270$
- Range:  $y \in \mathbb{R}$
- The value of  $a$  affects the steepness of each of the 'branches' of the graph. The greater the value of  $a$  the faster the branches of the graph approach the asymptotes.
- Changing values of  $q$  will move the graph vertically up or down



## Test Yourself

### Question 1

The range of  $y = \tan x$  is

- A.  $y \in \mathbb{R}$
- B.  $y \in [0; 180]$ ;  $y \neq 90$ ,  $y \neq 270$
- C.  $x \in \mathbb{R}$
- D.  $x \in [0; 180]$ ;  $y \neq 90$ ,  $y \neq 270$

### Question 2

The period of  $f(x) = \sin x$  is:

- A.  $x \in (-\infty; \infty)$
- B.  $x \in (0; 360)$
- C.  $360^\circ$
- D.  $y \in (0; 360)$

### Question 3

The amplitude of  $\tan x$  is:

- A.  $y \in \mathbb{R}$
- B. 1
- C.  $\frac{1}{2}$
- D. does not exist

### Question 4

The coordinates of the maximum turning point of the graph

$f(x) = 2\cos x$  for  $x \in [0; 180]$  are:

- A. (0; 1)
- B.  $x \in (-2; 2)$
- C. (0; -2)
- D. (0; 2)

### Question 5

The range of  $y = \sin x - 1$  is:

- A.  $y \in \mathbb{R}$
- B.  $x \in (-2; 0)$
- C.  $x \in [-2; 0]$
- D.  $y \in (-2; 0)$

**Improve your Skills****Question 1**

Draw a sketch graph of  $y = \tan x + 1$ ;  $x \in [0; 180]$

**Question 2**

Sketch the graphs of  $f(x) = 2\sin x$  and  $g(x) = \cos x - 1$  on the same set of axes;  $x \in [0; 360]$ .

Use your graph to determine:

- $f(180^\circ)$
- $g(180^\circ)$
- $g(270^\circ) - f(270^\circ)$
- the range of  $g$
- the amplitude and period of  $f(x)$