

# PERIODIC FUNCTIONS

A function is periodic if *Youtube: "Sinusoidal Functions Part 1" by nscclpmat*

- the graph repeats at regular intervals
  - the y-values repeat at regular intervals
- Periodic Function

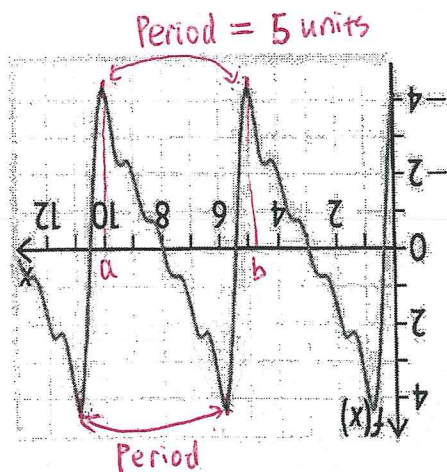
A function that describes periodic data can be described as sinusoidal function

A cycle is one pattern → symmetrical wave

The **period** is the horizontal distance of one cycle

↳ distance between two crest or two bottoms

The following function is periodic. Highlight one cycle and state the period.



→ Periodic Function

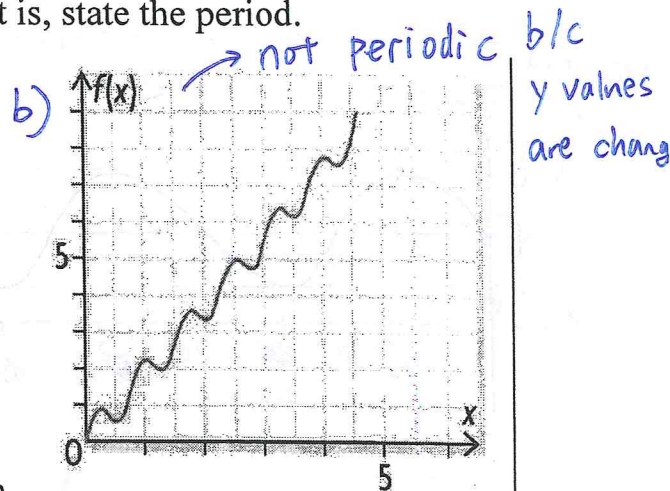
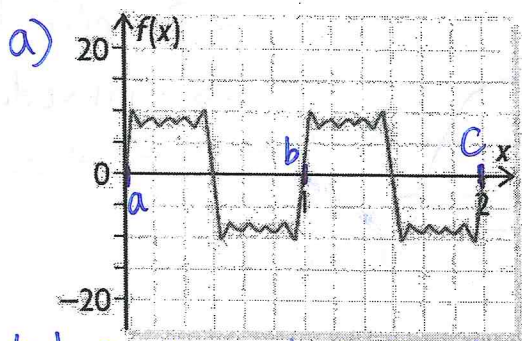
→ Not sinusoidal function

\* y values repeat at regular intervals → ∴ periodic function

Ex1) Determine whether the function is periodic.

If it is, state the period.

a) b)



Distance a to b is 1. b to c = 1

There

are several properties or characteristics that can be used to describe sinusoidal functions. These include period, amplitude, and phase shift.

Example 2

= Max - sinusoidal axis = vertical distance from axis to the max or min point

**Amplitude** – Half the difference between the maximum value of the function and the minimum value of the function.

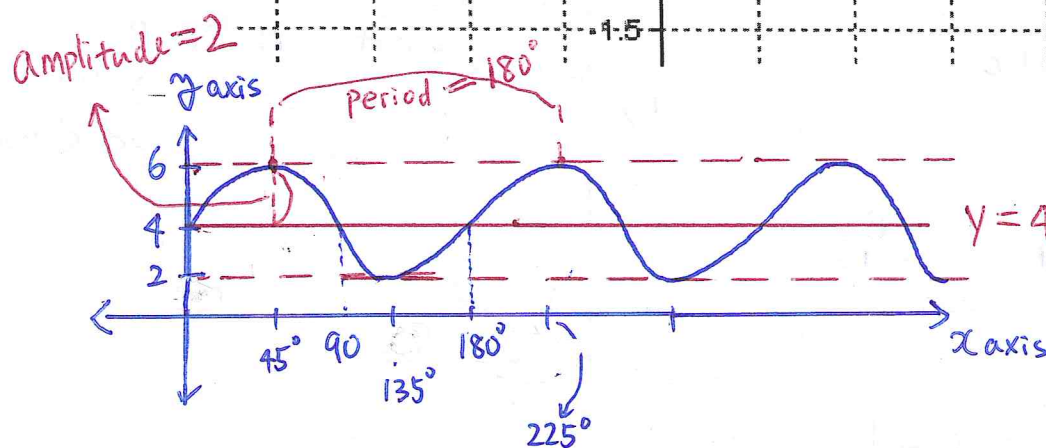
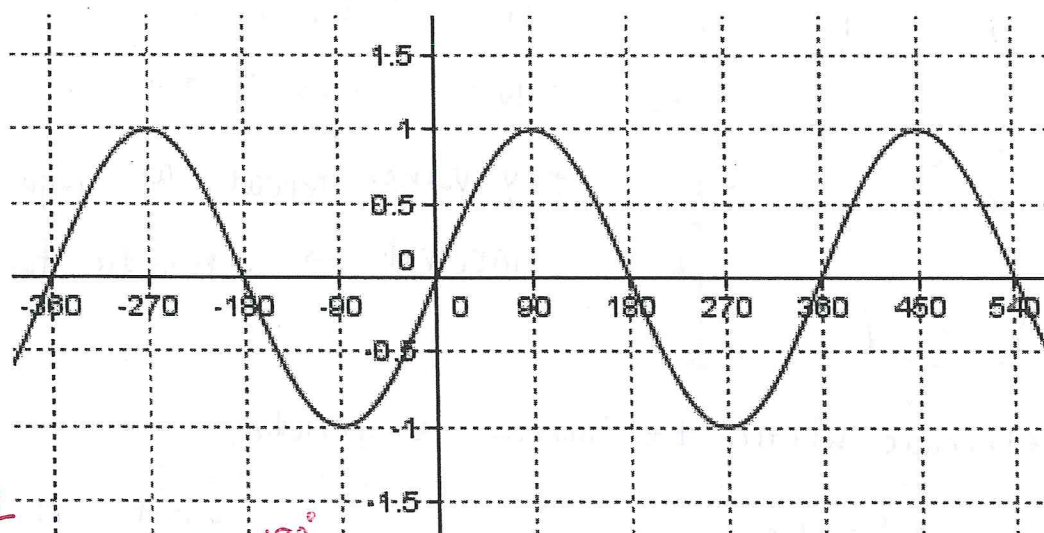
# PERIODIC FUNCTIONS

$$= \text{sinusoidal axis} = \frac{\text{Max} + \text{Min}}{2} = \text{"Middle line"}$$

Axis of the Curve – A horizontal line that is half-way between the maximum and minimum values.

**Phase Shift** – The horizontal shift of a graph from its original position.

\*Phase shift depends on the original graph – for example the phase shift for a sine graph and a cosine graph are different



→ Periodic function

→ Sinusoidal function

$y=4$  → axis of the curve

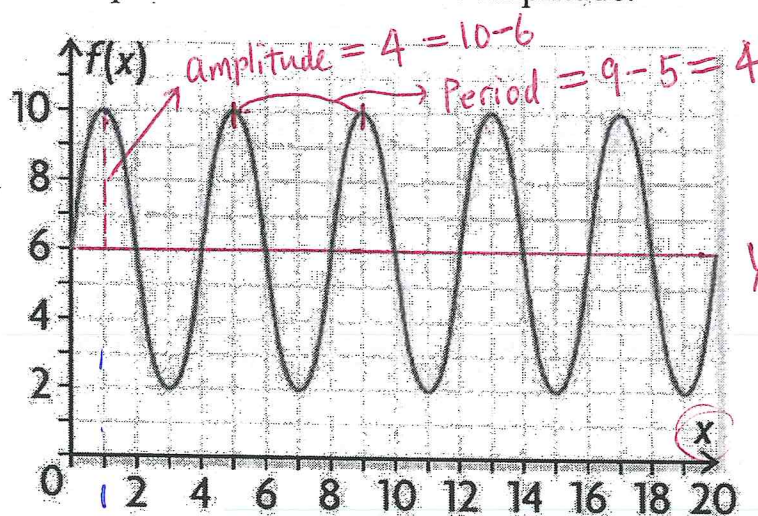


# PERIODIC FUNCTIONS

For the following periodic function, highlight one cycle.

Draw the axis of the curve.

State the period and calculate the amplitude.



$$\frac{\text{Max} + \text{Min}}{2} = \frac{10 + 2}{2} = 6$$

$y=6$  (axis of curve)

From the graph, what is  $f(1)$ ?  $f(5)$ ?  $f(9)$ ?  $f(13)$ ?

When  $x=1 \rightarrow y=? \Rightarrow f(1)=10$   $f(5)=10$   $f(9)=10$

What is  $f(45)$ ?

$f(45) = 10$  because of period = 4

For a periodic function,  $f(x)=f(x \pm p)$  where  $p$  is the period.

$f(13)=10$

$f(9)=10$

HW p290 #1, #2

$y = \sin \theta$

#3

Sketch a graph with the main points:

Domain: \_\_\_\_\_

Range: \_\_\_\_\_

Period: \_\_\_\_\_

Amplitude: \_\_\_\_\_

Roots: \_\_\_\_\_

$y = \cos \theta$

Sketch a graph with the main points:

Domain: \_\_\_\_\_

**PERIODIC FUNCTIONS**

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Range: \_\_\_\_\_

Period: \_\_\_\_\_

Amplitude: \_\_\_\_\_

Roots: \_\_\_\_\_

What translation would map the graph of  $y = \sin\theta$  onto  $y = \cos\theta$ ?

**$y = \tan\theta$**

There are certain values of  $\theta$  for which  $y = \tan\theta$  is undefined. The graph of

$y = \tan\theta$  is said to have asymptotes at these points. Broken vertical lines represent the asymptotes.

Sketch a graph with the main points:

Domain: \_\_\_\_\_

Range: \_\_\_\_\_

Period: \_\_\_\_\_

Roots: \_\_\_\_\_