

# 5.1

## Graphing Sine and Cosine Functions

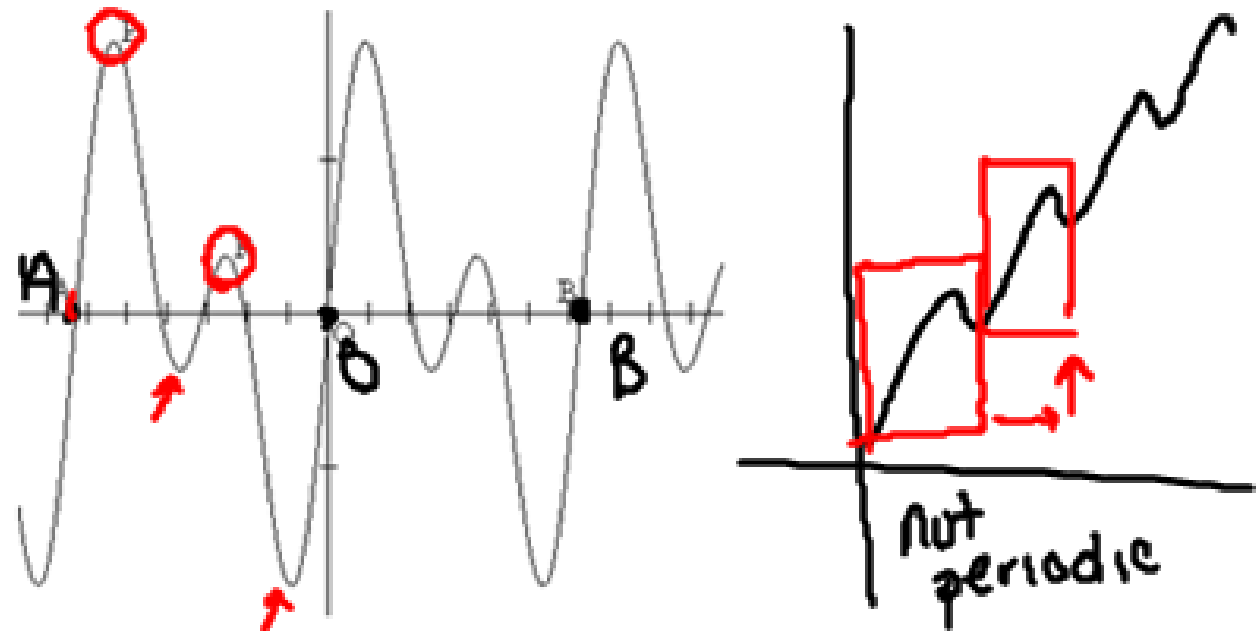
### Focus on...

- sketching the graphs of  $y = \sin x$  and  $y = \cos x$
- determining the characteristics of the graphs of  $y = \sin x$  and  $y = \cos x$
- demonstrating an understanding of the effects of vertical and horizontal stretches on the graphs of sinusoidal functions
- solving a problem by analysing the graph of a trigonometric function

## Periodic and Sinusoidal functions

- Periodic functions are characterized by the fact that the graph can be divided into intervals, called a period, such that the graph in any interval can be translated horizontally onto the graph in any other interval.

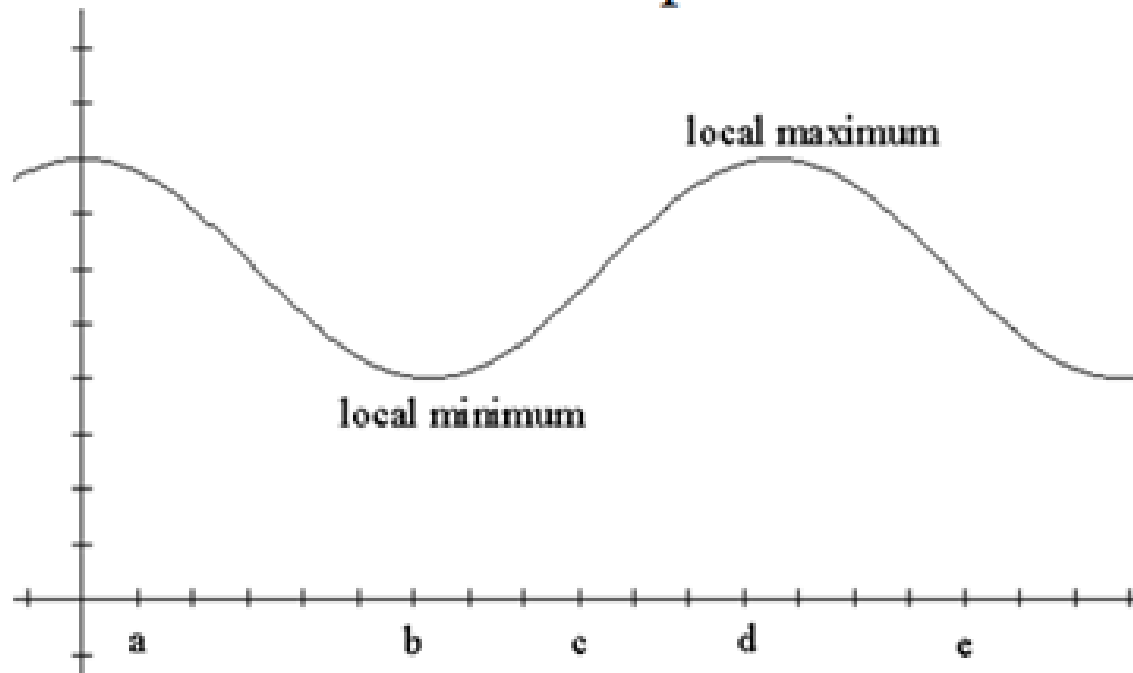
Example:



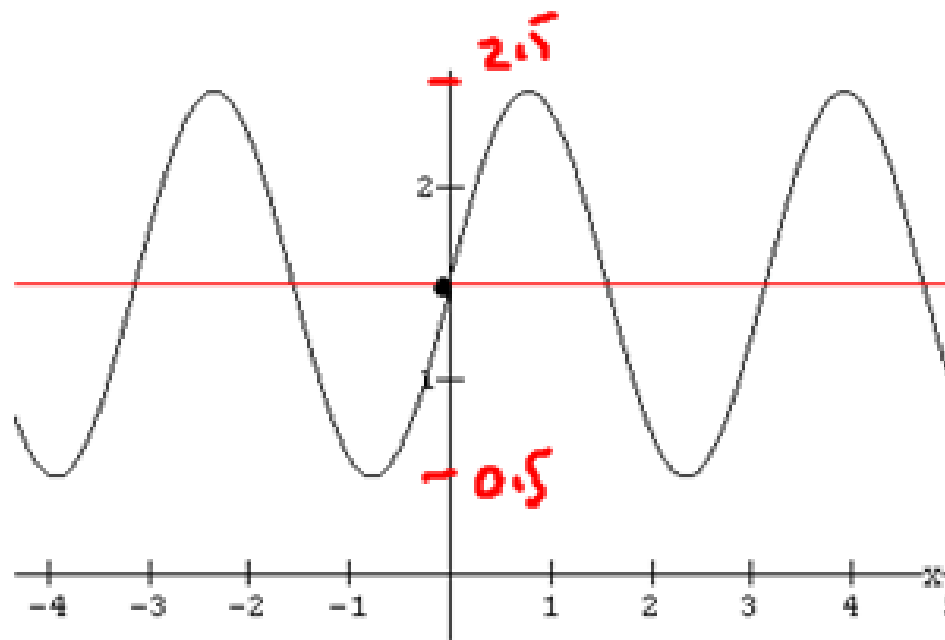
The graph in the interval from A to O can be translated to match exactly the graph in the interval from O to B.

## Sinusoidal Functions

- A function that produces a graph that looks like waves, and has only one local maximum and one local minimum in each periodic interval.



- A sinusoidal axis is a horizontal line HALFWAY between the local maximum and local minimum in each periodic interval.

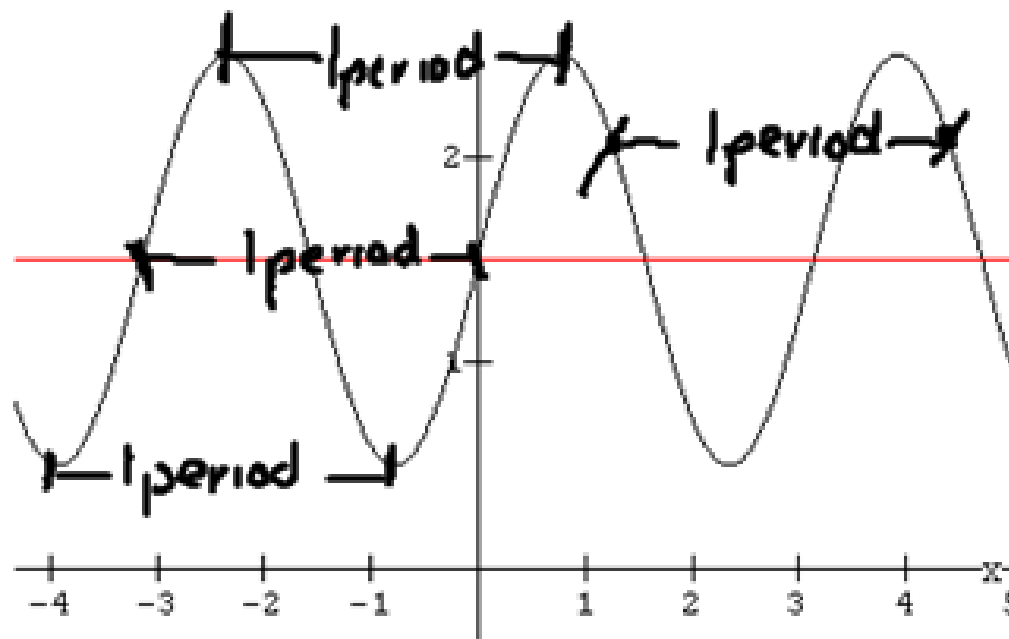


math 12  
midline

IB  
principle  
axis

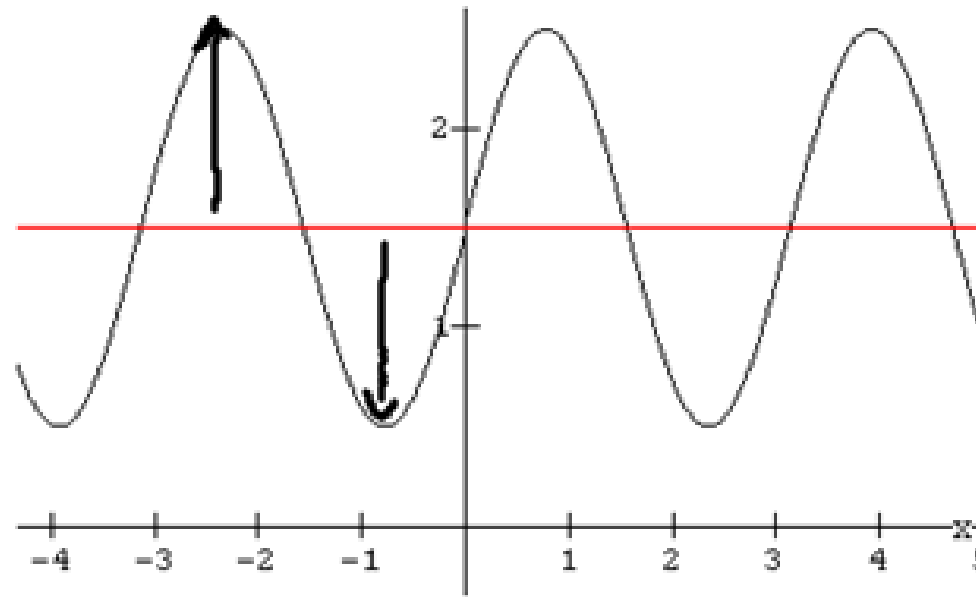
$$\begin{aligned}
 \text{SA.} \cdot y &= \frac{\text{local max} + \text{local min}}{2} = \frac{2.5 + (-0.5)}{2} \\
 &= \frac{2}{2} \\
 y &= 1.5
 \end{aligned}$$

**Period** - The change in the x value corresponding to one cycle of a sinusoidal function. A cycle is a portion of the graph from one point to the point at which the graph starts to repeat.



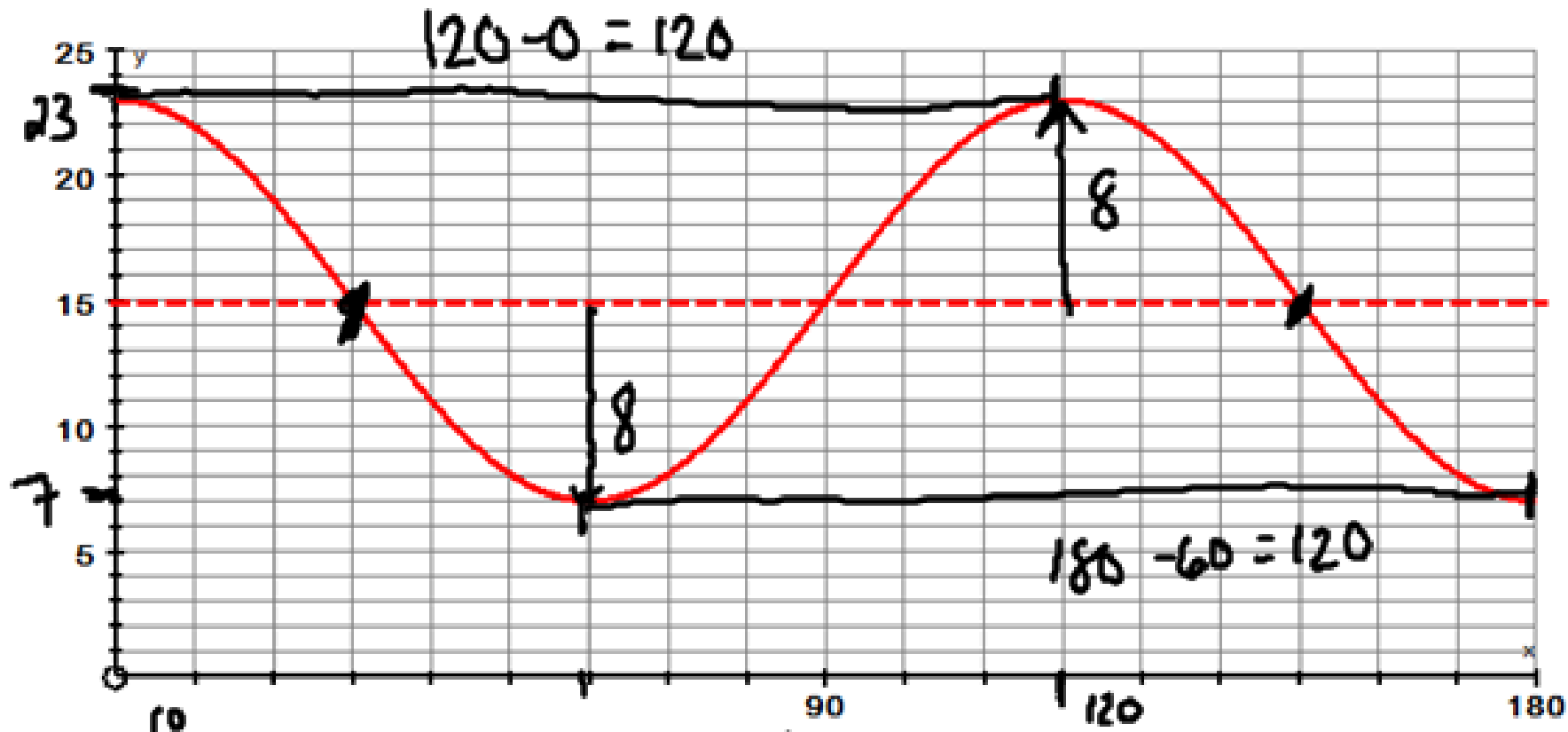
$$\text{Period} = \text{right } x \text{ value} - \text{left } x \text{ value}$$

**Amplitude** -the vertical distance from the sinusoidal axis to a local maximum or local minimum



$$\begin{aligned} \text{Amp} &= \frac{\text{local max} - \text{local min}}{2} = \frac{2.5 - 0.5}{2} \\ &= \frac{2}{2} \\ &= 1 \end{aligned}$$

Example: Using the graph given below, find its period, amplitude and the equation of its sinusoidal axis.



$$\begin{aligned}
 \text{SA: } y &= \frac{\text{local Max} + \text{local min}}{2} \\
 &= \frac{7 + 23}{2} \\
 &= 15
 \end{aligned}$$

$$\begin{aligned}
 \text{Amp: } & \frac{23 - 7}{2} \\
 &= \frac{16}{2} \\
 &= 8
 \end{aligned}$$

$$\begin{aligned}
 \text{Period: } & 150 - 30 \\
 &= 120
 \end{aligned}$$