

Periodic Functions

Warm Up

State the domain and range of the following functions:

a) $y = x$

$$D = \{x \in \mathbb{R}\}$$

$$R = \{y \in \mathbb{R}\}$$

c) $y = \frac{1}{x}$

$$D = \{x \in \mathbb{R} \mid x \neq 0\}$$

$$R = \{y \in \mathbb{R} \mid y \neq 0\}$$

b) $y = x^2$

$$D = \{x \in \mathbb{R}\}$$

$$R = \{y \in \mathbb{R} \mid y \geq 0\}$$

d) $y = x^3$

$$D = \{x \in \mathbb{R}\}$$

$$R = \{y \in \mathbb{R}\}$$



Vocabulary

Periodic function: a function whose graph repeats at regular intervals; the y-values in the table of values show a repetitive pattern when the x-values change by the same amount.

Period: the change in the independent variable (typically x) corresponding to one cycle.

Cycle: the cycle of a periodic function is a portion of the graph that repeats

Trough: the minimum point on a graph

Peak: the maximum point on a graph

Vocabulary

Axis of the curve: the equation of the horizontal line halfway between the maximum and the minimum. This is often called the "equation of the axis". It is determined by:

$$y = \frac{\text{max value} + \text{min value}}{2}$$

AXIS
⇒ ADD

Amplitude: half of the difference between the maximum and the minimum values; it is also the vertical distance from the function's axis to the max or min values. It is determined by:

$$\text{amplitude} = \frac{\text{max value} - \text{min value}}{2}$$

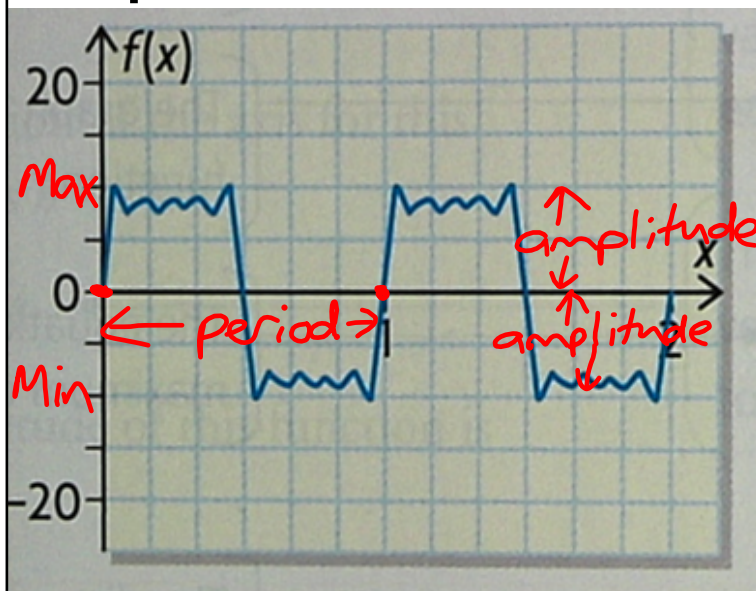
AMPLITUDE
⇒ SUBTRACT

Examples

For each of the following graphs state:

- If it is periodic
- The maximum value
- The minimum value
- The equation of the axis of curve
- The period
- The amplitude

Graph # 1



Periodic \rightarrow Yes

$$\text{Max} = 10$$

$$\text{Min} = -10$$

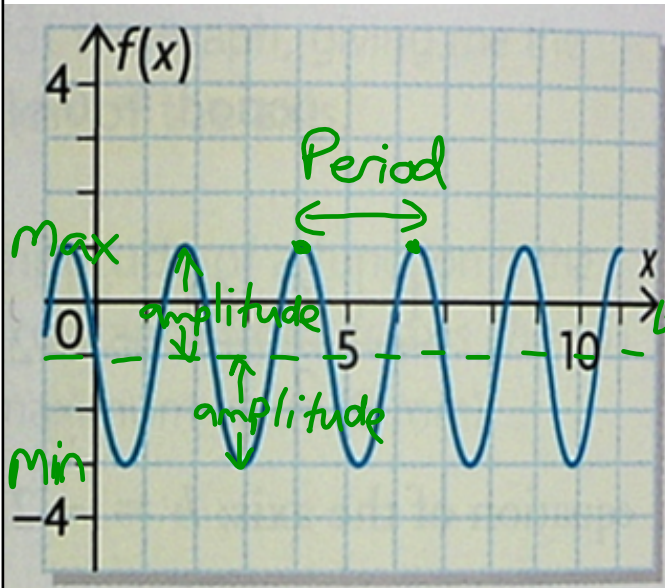
$$\text{Axis of curve} = \frac{10 + (-10)}{2}$$

$$= \frac{0}{2}$$

$$y = 0$$

$$\text{Amplitude} = \frac{10 - (-10)}{2} = \frac{20}{2} = 10$$

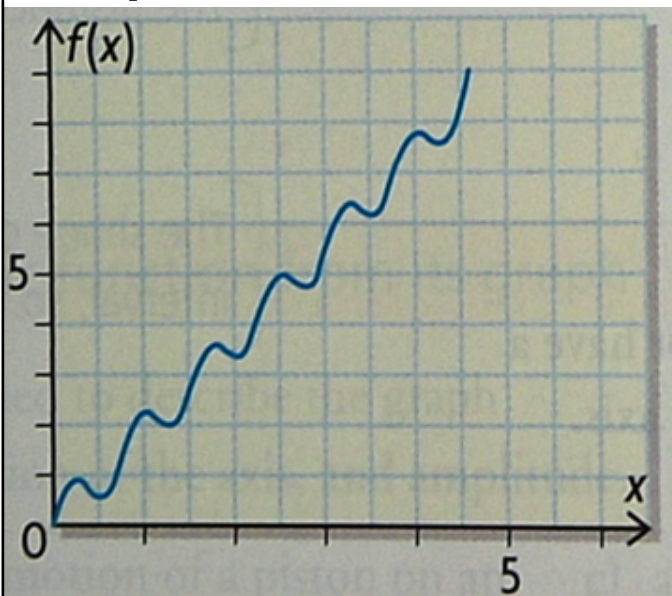
$$\text{Period} = 1$$

Graph # 2

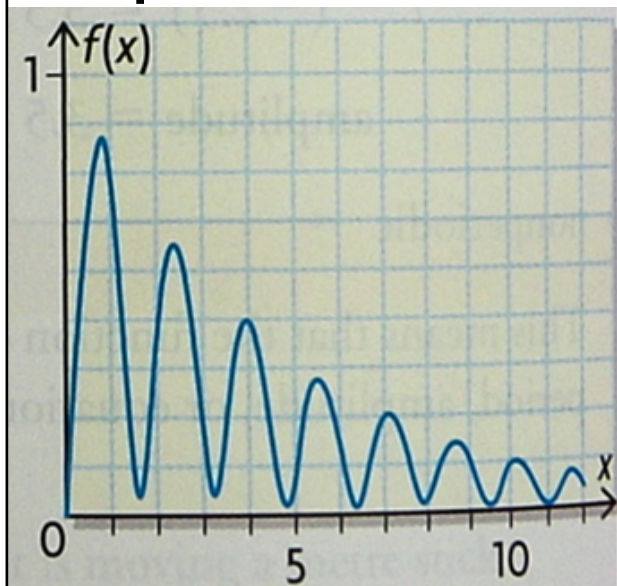
Periodic \rightarrow Yes
 Max = 1
 Min = -3
 Axis of = $\frac{1 + (-3)}{2}$
 curve
 $= \frac{-2}{2}$
 $y = -1$

$$\text{Amplitude} = \frac{1 - (-3)}{2} = \frac{4}{2} = 2$$

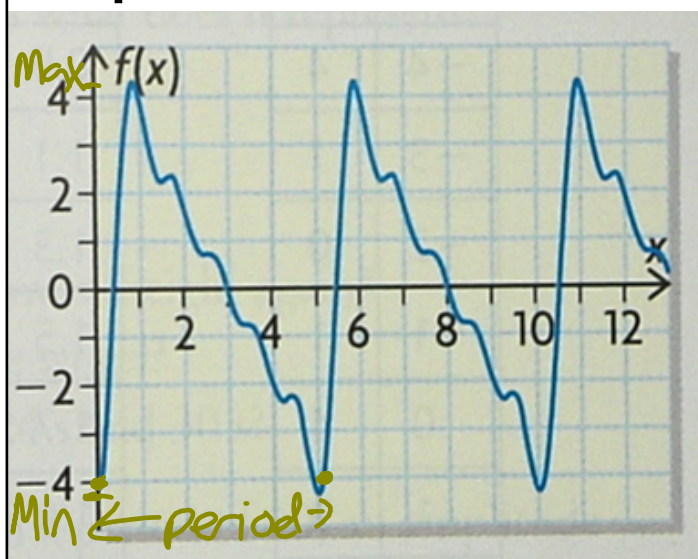
$$\text{Period} = 2.2 \text{ [time from max to max]}$$

Graph # 3

Periodic \rightarrow No

Graph # 4

Periodic \rightarrow No

Graph # 5

Periodic \rightarrow Yes

$$\text{Max} = 4.2$$

$$\text{Min} = -4.2$$

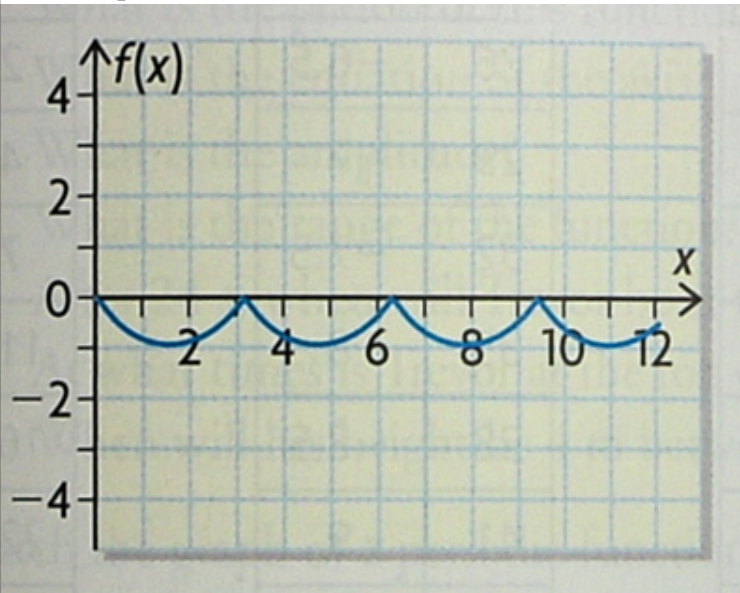
$$\text{Axis of curve} = \frac{4.2 + (-4.2)}{2}$$

$$= \frac{0}{2}$$

$$y = 0$$

$$\text{Amplitude} = \frac{4.2 - (-4.2)}{2} = \frac{8.4}{2} = 4.2$$

$$\text{Period} = 5$$

Graph # 6Periodic \rightarrow Yes

Max = 0

Min = -1

Axis of curve = $\frac{0 + (-1)}{2}$

$$y = -\frac{1}{2}$$

Amplitude = $\frac{0 - (-1)}{2} = \frac{1}{2}$

Period = π

Homework

Nelson Page 352 #s 2, 3, 6, 7, 8 & 12

