6.1 Periodic Functions.

- This chapter deals with sinusoidal functions, which are also a periodic function. A sinusoidal fn is $f(x) = \sin(x)$ and $g(x) = \cos(x)$.

- Periodic functions have many properties, so let's take a look.

Periodic Fn

- a function which repeats over regular/equal intervals.
- the function values ($f(x)$ or y) repeat.

Period

- the change in the x-values corresponding to one cycle

Cycle - the part that repeats.

Peak - the maximum

Trough - the minimum

Equation of Axis - the equation of the horizontal line halfway between the peak and trough

$$y = \frac{\text{peak} + \text{trough}}{2}$$

Amplitude

- the distance from the equation of axis to either the peak or trough.

- always positive

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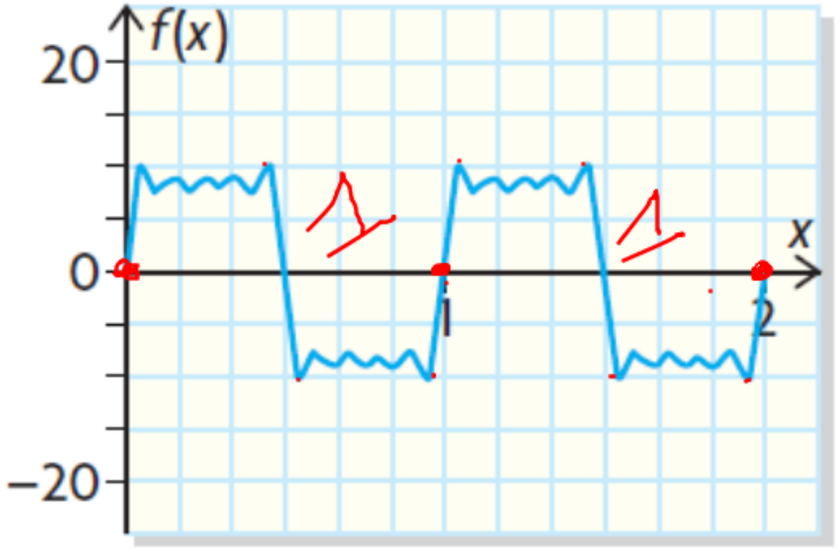
1.

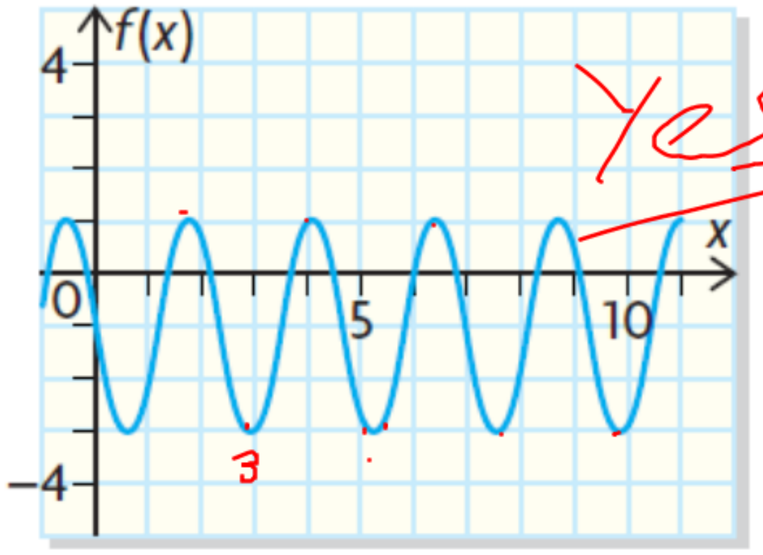
Which of the following graphs are periodic? Explain why or why not.

a)



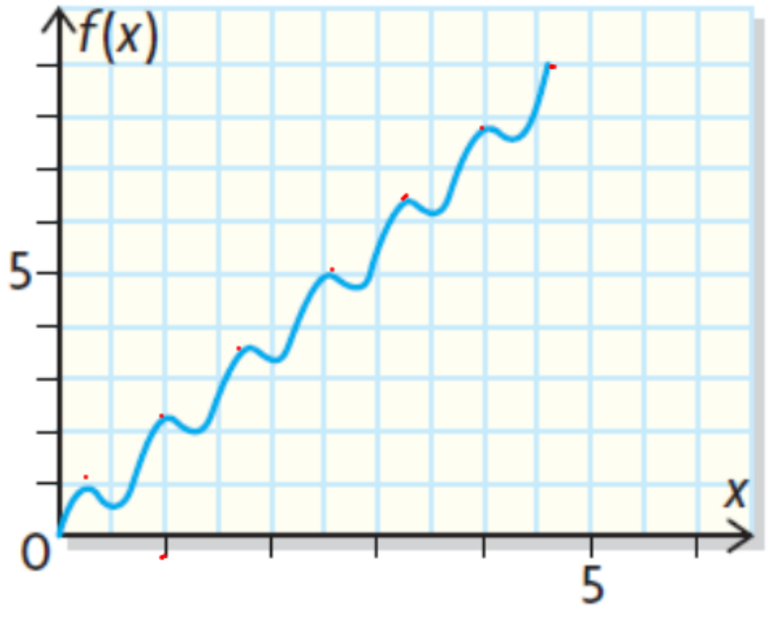
Yes

c)



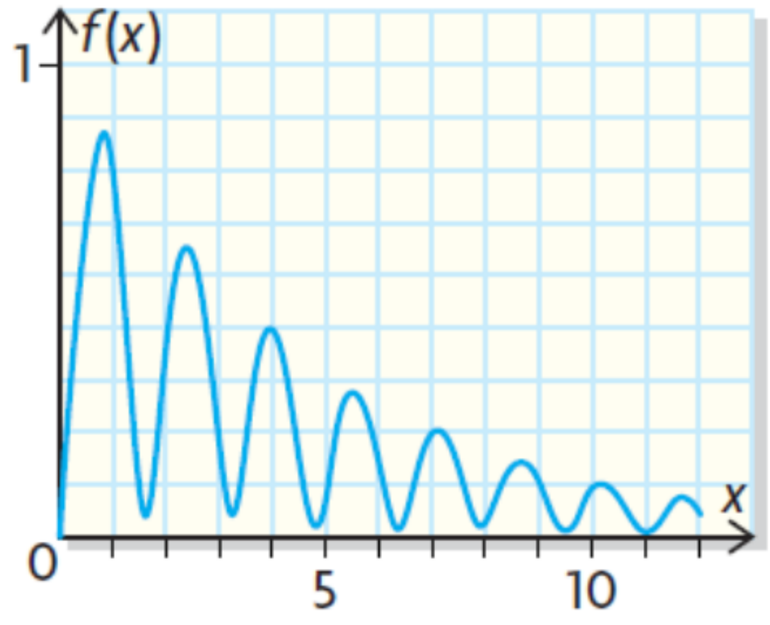
Yes

b)



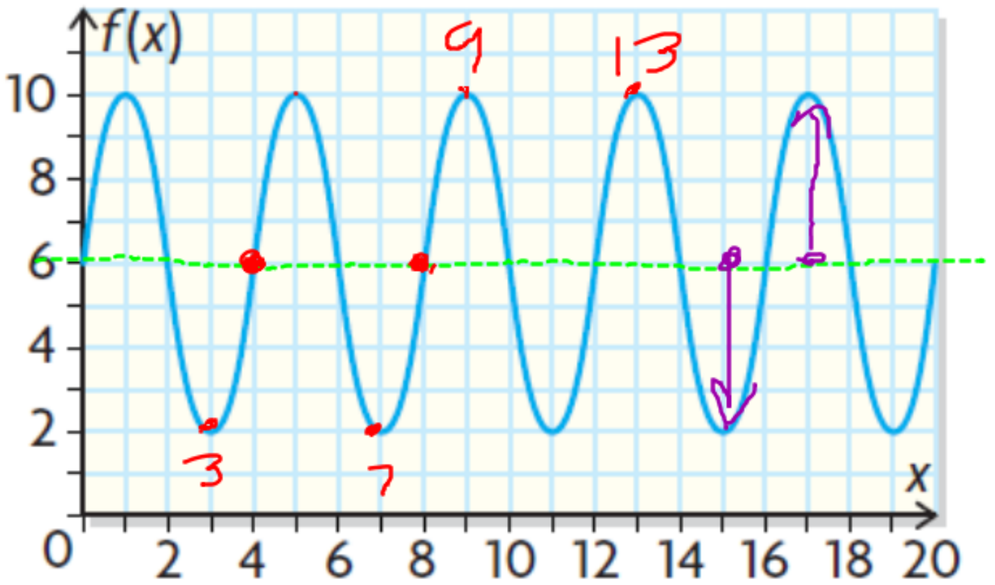
No

d)



No

Determine the range, period, equation of the axis, and amplitude of the function shown.



Range: Min to max

: $2 \leq f(x) \leq 10$

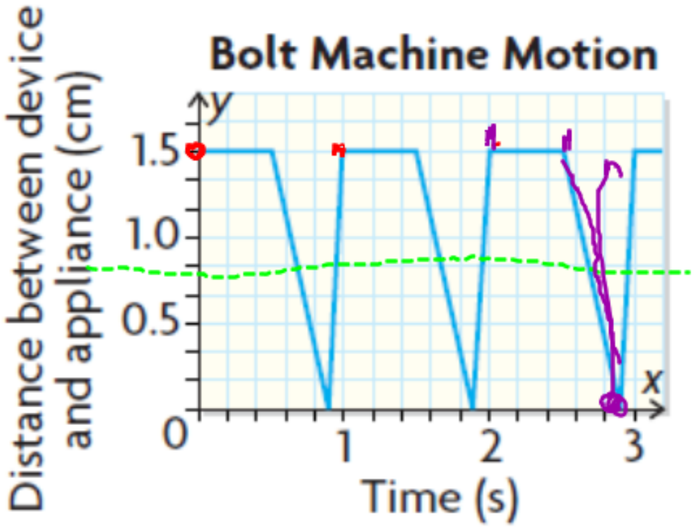
Period: 4

Eq'n of Axis: $y = \frac{10+2}{2} = 6$

Amplitude: $6-2=4$

or

$10-6=4$



3. The motion of an automated device for attaching bolts to a household appliance on an assembly line can be modelled by the graph shown at the left.

a) What is the period of one complete cycle? = 1 second

b) What is the maximum distance between the device and the appliance? 1.5

c) What is the range of this function? $0 \leq y \leq 1.5$

d) If the device can run for five complete cycles only before it must be turned off, determine the domain of the function. $0 \leq x \leq 5$

e) Determine the equation of the axis.

f) Determine the amplitude.

g) There are several parts to each complete cycle of the graph. Explain what each part could mean in the context of "attaching the bolt."

e) $y = \frac{0 + 1.5}{2} = 0.75$

f) $1.5 - 0.75 = 0.75$