

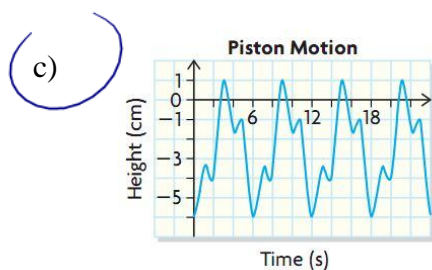
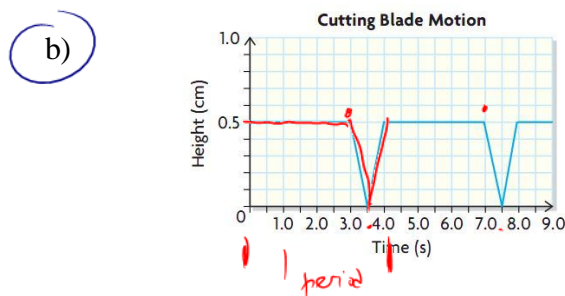
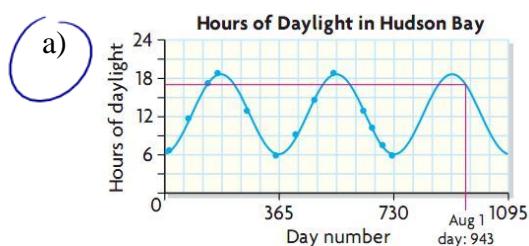
Chapter 6 – Sinusoidal Functions

6.1 – Properties of Periodic Functions

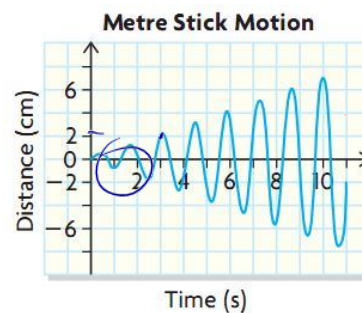
Definition 6.1.1

A **Periodic Function** is one in which **the functional values repeat**. (over a specific "chunk size" of domain values)
e.g. Consider the following pictures: Determine which are periodic.

functional values
domain values



d)



Definition 6.1.2

The **Period** of a periodic function is the amount of the **domain values** where **one cycle** takes place. "chunk-size"

Example 6.1.1

Determine the periods of the above periodic functions:

a) $P = 365$ days

b) $P = 4$ seconds

c) $P = 6$ seconds

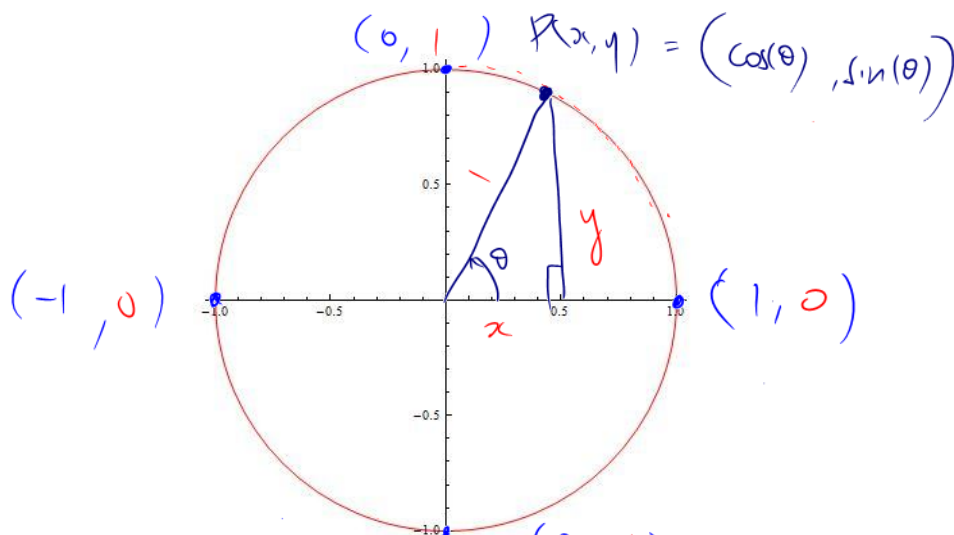
What about the functions $f(\theta) = \sin(\theta)$ and $g(\theta) = \cos(\theta)$?

(Note: These are the so-called Sinusoidal Functions)

Consider the circle of radius 1:

$$\cos(\theta) = x$$

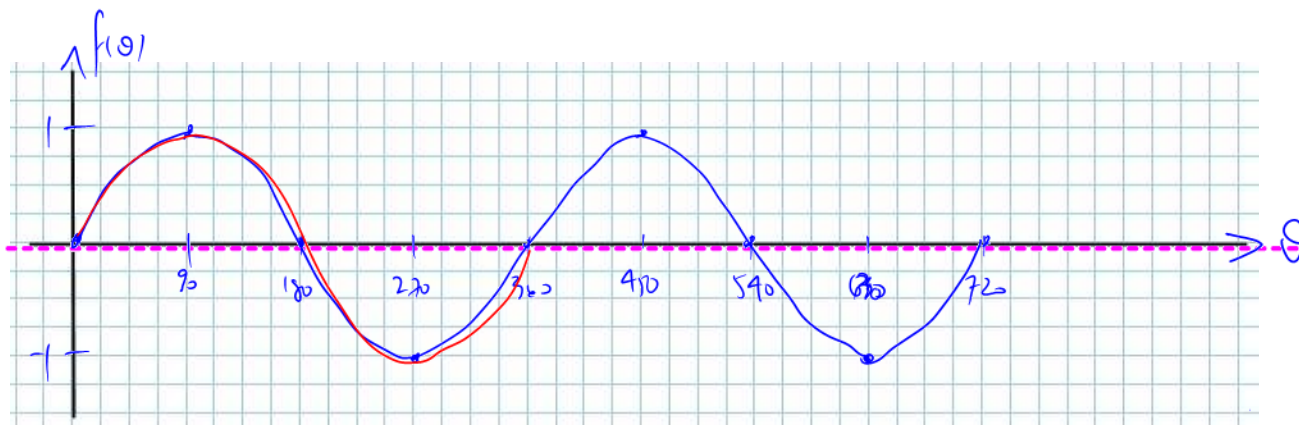
$$\sin(\theta) = y$$



Note: As $P(x, y)$ "changes" $\Rightarrow \theta$ is changing.
 \Rightarrow both $\cos(\theta)$ & $\sin(\theta)$ are functions

Sketches

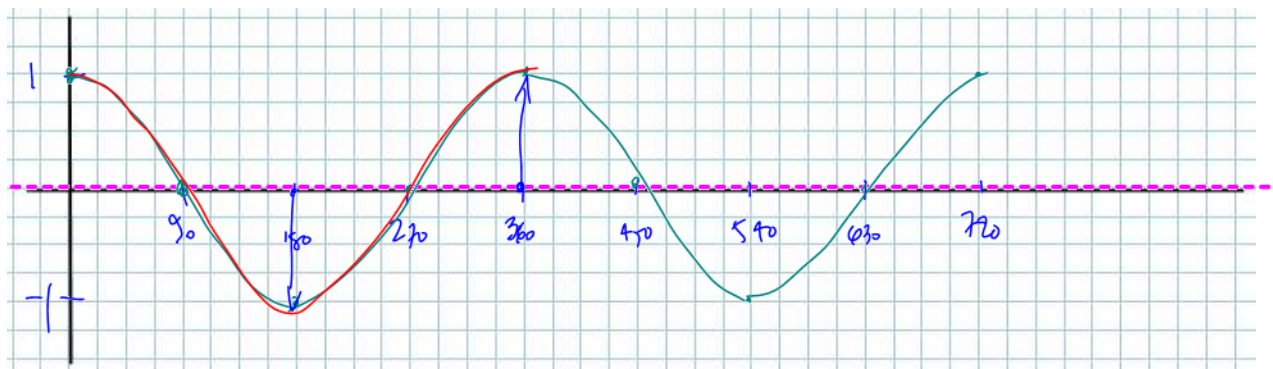
$$f(\theta) = \sin(\theta) \quad 0^\circ \leq \theta \leq 720^\circ$$



$\leftarrow 360^\circ \rightarrow$

↪ 1 period of sine

$$g(\theta) = \cos(\theta) \quad 0^\circ \leq \theta \leq 720^\circ$$



← Period = 360° →

Definition 6.1.3

a) The **Amplitude** of a periodic function is half of the distance between a maximum value and a minimum value.

$$\text{Amplitude} = \frac{\text{max} - \text{min}}{2}$$

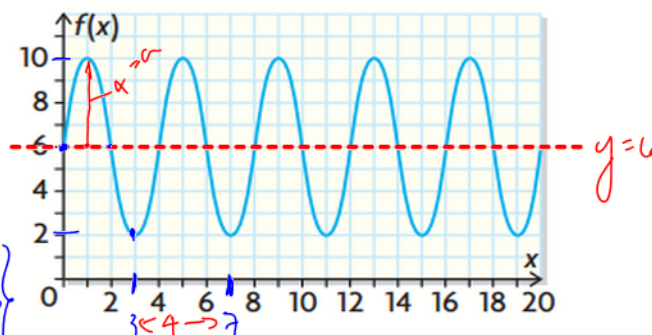
b) The **Central Axis** is half way between the maximum value and the minimum value.

The equation of The Central Axis is given by $y = \frac{\text{max} + \text{min}}{2}$.

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

max = 10
min = 2
Period = 4

Range: $\{f(x) \in \mathbb{R} \mid 2 \leq f(x) \leq 10\}$



$$k = \frac{360}{4} = 90$$

$$a = \frac{\text{max} - \text{min}}{2} = \frac{10 - 2}{2} = 4$$

$$\text{CA } y = \frac{\text{max} + \text{min}}{2} = \frac{10 + 2}{2} = 6$$