

## SATPREP

### Assignment : Transformations of Trigonometric Functions

A **Trigonometric** function is a function that is *like a sine function* in the sense that the function can be produced by shifting, stretching or compressing the sine function.

You can graph **Trigonometric** functions using your knowledge of transformations.

There are 5 transformations that can affect trig functions:

- horizontal stretch (HS) alters the period
- vertical stretch (VS) alters the amplitude
- horizontal translation (HT) causes a phase shift relocating our initial point
- vertical translation (VT) relocates the trigonometric axis
- reflection ( $\pm$ ) changes the pattern of our 5 key points

Some basic vocabulary should be observed as shown in the diagram:

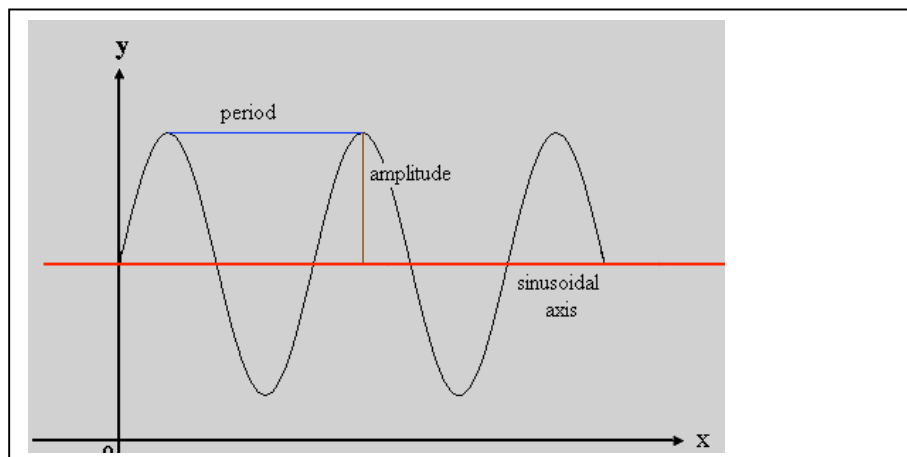
**Period:** a complete cycle of the graph where the graph starts to repeat.

**Principal axis:** horizontal line halfway between the local maximum and minimum.

**Amplitude:** vertical distance from the trigonometric axis to the maximum or minimum

**Local maximum:** the tops of each “wave”, all equal in value

**Local minimum:** the bottoms of each “wave”, all equal in value



## Finding the Amplitude, Period and principal Axis

The amplitude, period and trigonometric axis must be found to model periodic relationships using the trigonometric functions sine and cosine. Both degree and radian angle measurements are used.

### Example:

Determine the amplitude, period and the equation of the trigonometric axis for this function. State the mapping rule.

$$2y - 1 = \sin(x + 45^\circ)$$

### Solution:

amplitude = 0.5

period =  $360^\circ$  or  $\pi$  (rad)

trigonometric axis  $y = 1$

### Exercise:

Determine the amplitude, period and the equation of the trigonometric axis for each function. State the mapping rule.

1.  $y - 2 = \sin 3x$

2.  $y + 4 = 2\sin(x + 90^\circ)$

3.  $-2y = \sin 0.25x$

4.  $3y = \sin(x - 10^\circ)$

### Solutions:

1. amplitude = 1      period =  $120^\circ$  or  $\frac{\pi}{3}$  (rad)      principal axis  $y = 2$

2. amplitude = 1      period =  $180^\circ$  or  $\frac{\pi}{2}$  (rad)      principal axis  $y = -4$

3. amplitude = 2      period =  $1440^\circ$  or  $4\pi$  (rad)      principal axis  $y = 0$

4. amplitude =  $\frac{1}{3}$       period =  $360^\circ$  or  $\pi$  (rad)      principal axis  $y = 0$