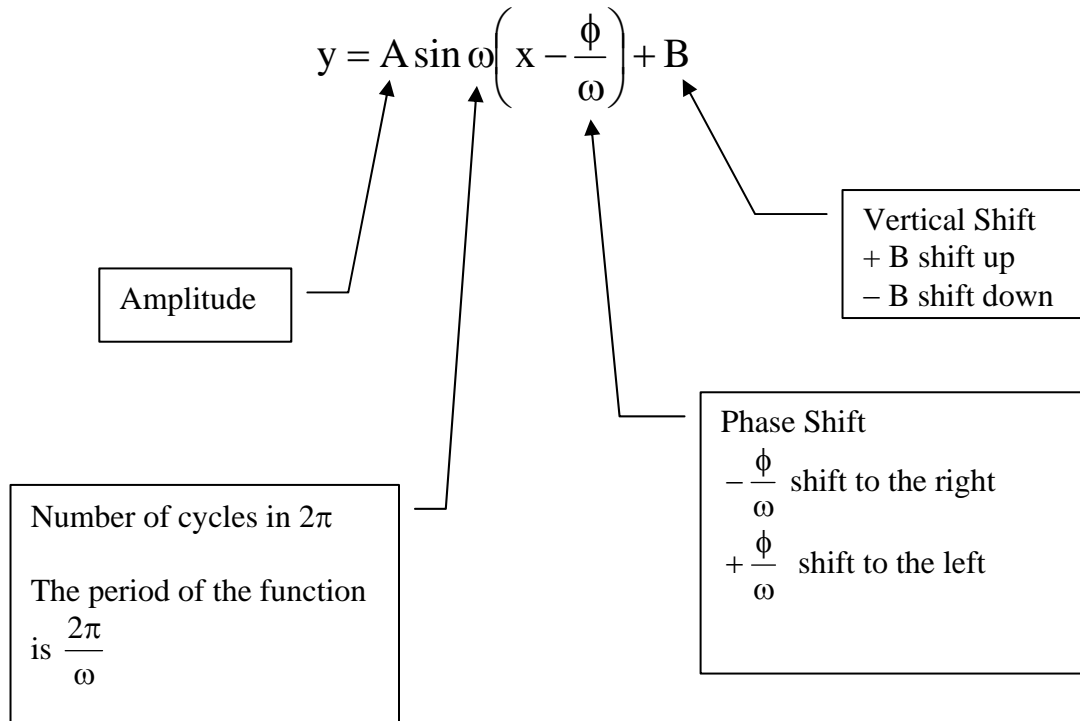




# Graphing Sine and Cosine Functions



## TO GRAPH SINE AND COSINE

- If necessary, rearrange the equation into the form:  $y = A \sin \omega \left( x - \frac{\phi}{\omega} \right) + B$
- Identify the amplitude.
- Identify the phase shift (if one exists).
- Identify the vertical shift (if one exists).
- Calculate the period.
- Find the key points (maximum and minimum values, intercepts) using the following procedure.
  - Divide the period into 4 equal parts.
  - Add the result to the starting point (point of phase shift or 0 if no phase shift exists) and for the next 4 points thereafter. (see example on page 2)
- Connect the points with a smooth curve.



# Graphing Sine and Cosine Functions

## EXAMPLE PROBLEM

$$y = 2 \sin(3x + \pi) + 1$$

### IDENTIFY VALUES

Rearrange the equation to:

$$y = 2 \sin 3\left(x + \frac{\pi}{3}\right) + 1$$

Amplitude = 2

Phase Shift =  $\pi/3$  units to the left

Vertical Shift = 1 unit up

$$\text{Period} = \frac{2\pi}{3}$$

### FIND KEY POINTS

Divide the period into 4 equal parts.

$$\frac{\frac{2\pi}{3}}{4} = \frac{2\pi}{3} \times \frac{1}{4} = \frac{2\pi}{12} = \frac{\pi}{6}$$

The starting point is  $-\frac{\pi}{3}$ ; write as  $-\frac{2\pi}{6}$  to

make calculations easier.

Add  $\pi/6$  to the starting point to find the second point.

$$-\frac{2\pi}{6} + \frac{\pi}{6} = -\frac{\pi}{6}$$

Continue adding  $\pi/6$  to find the remaining points.

$$-\frac{\pi}{6} + \frac{\pi}{6} = 0$$

$$0 + \frac{\pi}{6} = \frac{\pi}{6}$$

$$\frac{\pi}{6} + \frac{\pi}{6} = \frac{2\pi}{6} = \frac{\pi}{3}$$

