

$$y = d + a \cdot \sin b(x-c) \quad \text{or} \quad y = d + a \cdot \cos b(x-c)$$

### Applications of Trig Graphs

1. Write an equation of a sine function for the graph to the right.

a.) Find the equation of the sinusoidal axis.

$$y = -1 \rightarrow d = -1$$

b.) Find the amplitude.

$$a = 3$$

c.) Find the period.

$$\pi \rightarrow \frac{2\pi}{b} = \pi$$

$$b = 2$$

d.) Find the phase shift.

right  $\frac{\pi}{4}$  (and with a reflection)

e.) Write the equation as a sine function:  $f(x) = -1 - 3 \sin 2(x - \frac{\pi}{4})$

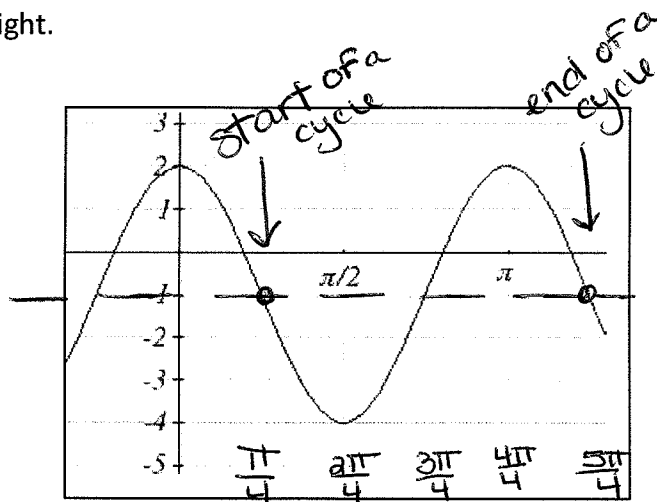
f.) What would the equation be for a cosine function?  $f(x) = -1 + 3 \cos 2x$

$$d = -1$$

$$a = 3$$

period doesn't change  $\rightarrow b = 2$

phase shift: none



2. The average monthly temperature ( $F^\circ$ ) in Juneau, Alaska can be approximated by the function defined by:

$$f(x) = 16 \sin \left[ \frac{\pi}{6}x - \frac{2\pi}{3} \right] + 40 \quad \text{where } x = 1 \text{ represents January}$$

a.) According to the model, what is the maximum and minimum temperature in Juneau?

\* what is the range??

sinusoidal axis:  $y = 40$   
amplitude = 16

range:  $[24, 56]$   
min  $\uparrow$  max

b.) What is the average temperature during the month of July?

$$\text{July} \rightarrow x = 7 \quad f(7) = 16 \sin \left[ \frac{\pi}{6}(7) - \frac{2\pi}{3} \right] + 40 = 56^\circ$$

c.) What is the average yearly temperature in Juneau?

Sinusoidal axis



right in the middle

$40^\circ$

3. The depth of water at a boat dock varies with the tides. The depth is 7 feet at low tide and 19 feet at high tide. On a certain day, low tide occurs at 4 a.m. and high tide at 10 a.m.

a.) Sketch a graph depicting one full period. Scale both axes. Find domain and range.

b.) Find the equation of the sinusoidal axis.

$$y = 13$$

c.) Find the amplitude.

$$6$$

d.) Find the period.

$$12 \text{ hours} \rightarrow b \cdot \frac{2\pi}{b} = 12 \cdot b$$

e.) Find the phase shift.

$$\frac{2\pi}{12} = \frac{12b}{12}$$

$$b = \frac{\pi}{6}$$

f.) Write the equation as a sine function

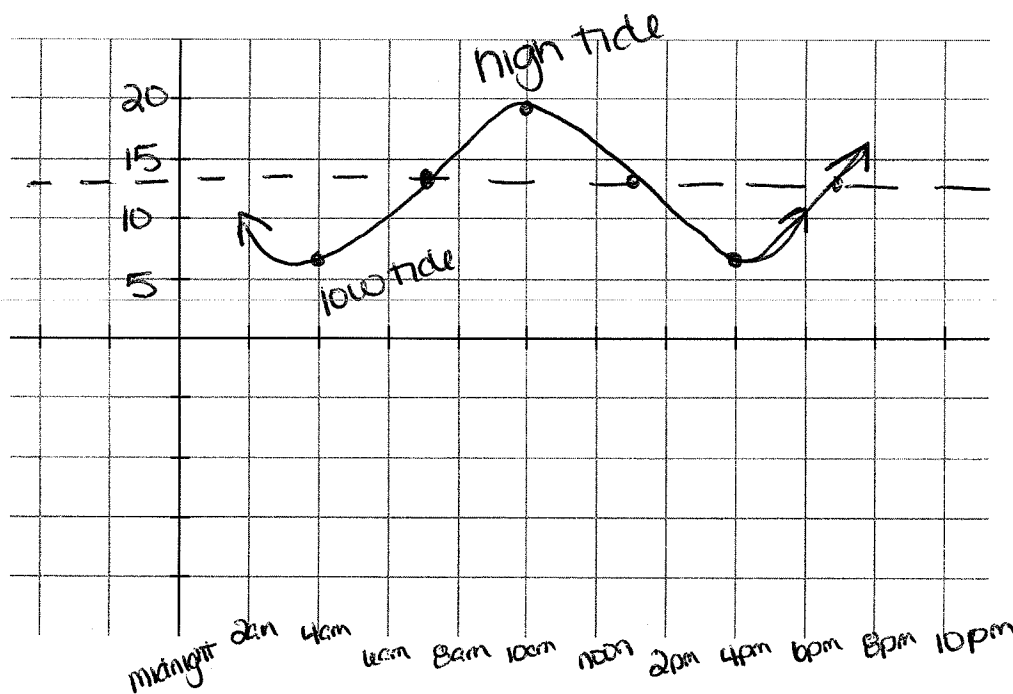
$$y = 13 + 6 \sin \frac{\pi}{6}(x - 7)$$

g.) What is the average rate of change of the water level from 4am to 10am.

$$4 \text{ am} \rightarrow (4, 7)$$

$$10 \text{ am} \rightarrow (10, 19)$$

$$\text{rate of change} = \frac{19 - 7}{10 - 4} = \frac{12}{6} = 2 = \boxed{2 \text{ feet per hour}}$$



$$y = 13$$