

5.5 - Writing Trigonometric Equations

Several different equations can represent the SAME GRAPH.

This is because these functions are periodic \rightarrow a phase shift of a sine function could look like a cosine function or vice versa.

Ex 1: Write the equation for the sine function that has the following properties

amplitude of 5 $\rightarrow a = 5$
 period of 240°
 phase shift of 45° to the right $d = 45^\circ$
 vertical shift up 3 units
 $\hookrightarrow c = 3$

$$\begin{aligned} \text{period} &= \frac{360}{k} \\ 240 &= \frac{360}{k} \\ k &= \frac{360}{240} \\ &= \frac{3}{2} \end{aligned}$$

$$\therefore y = 5 \sin \left[\frac{3}{2}(x - 45) \right] + 3$$

Ex 2: Write an equation for both sine and cosine function that has the following properties

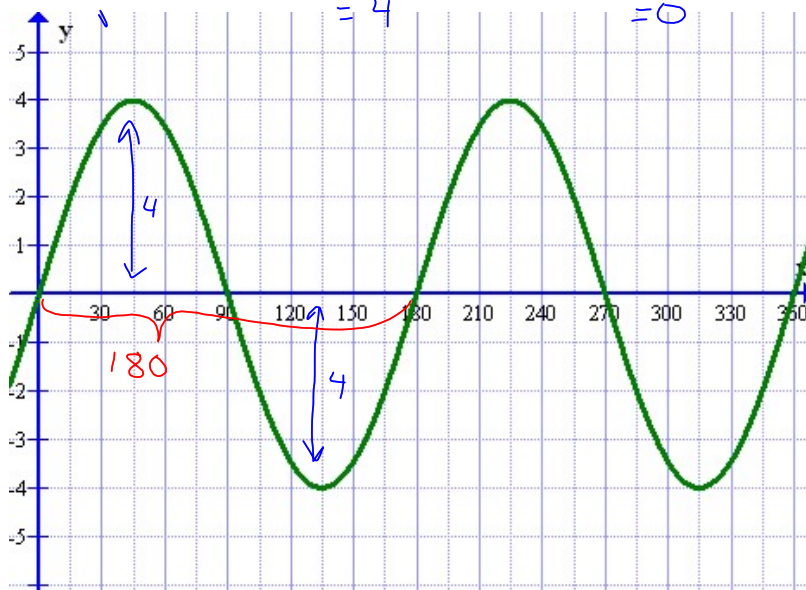
$$\begin{aligned} \text{Max} &= 4 \\ \text{Min} &= -4 \end{aligned}$$

$$\begin{aligned} a &= \frac{\text{max} - \text{min}}{2} \\ &= 4 \end{aligned}$$

$$\begin{aligned} c &= \frac{\text{max} + \text{min}}{2} \\ &= 0 \end{aligned}$$

amplitude: 4

a)



period: 180

$$\begin{aligned} \text{need } k &: \frac{360}{180} \\ &= 2 \end{aligned}$$

phase shift:

for sin fn: $d = 0$

for cos fn: $d = 45$

vertical shift

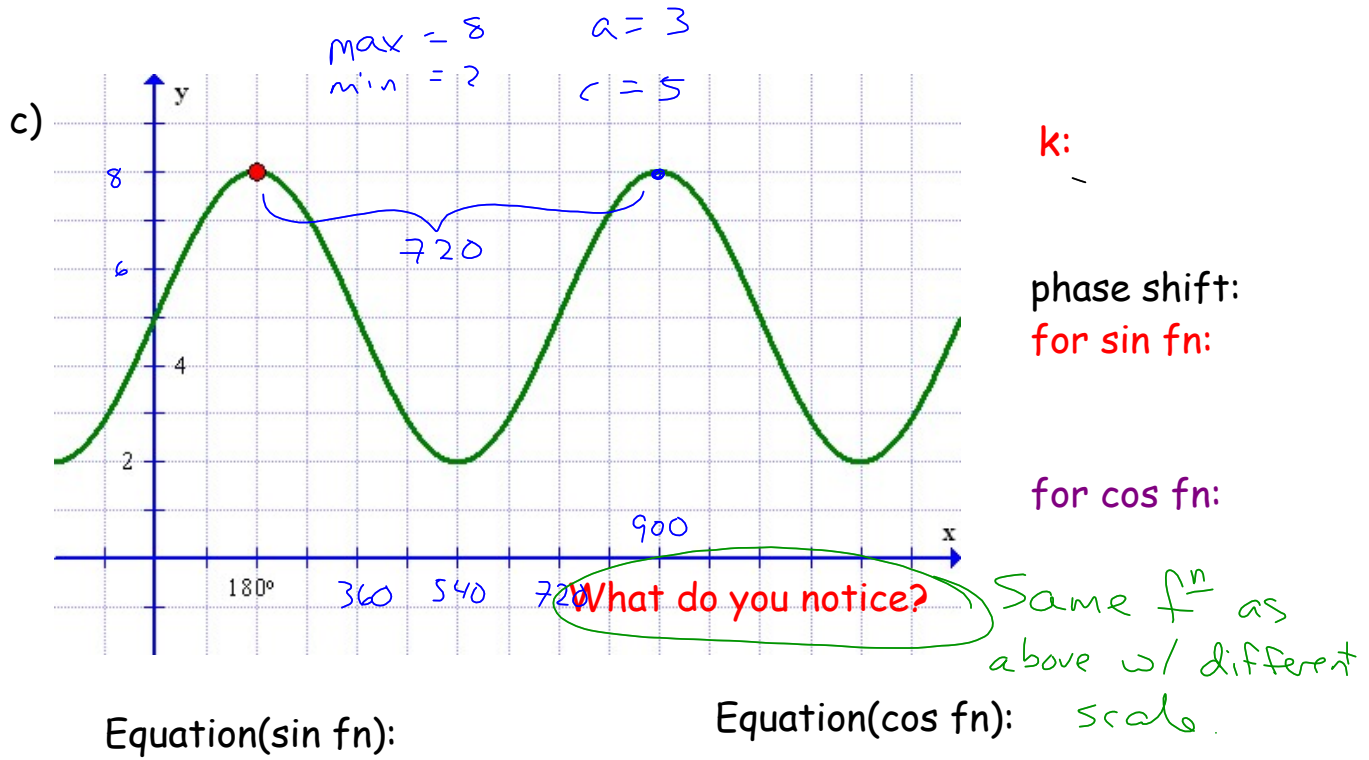
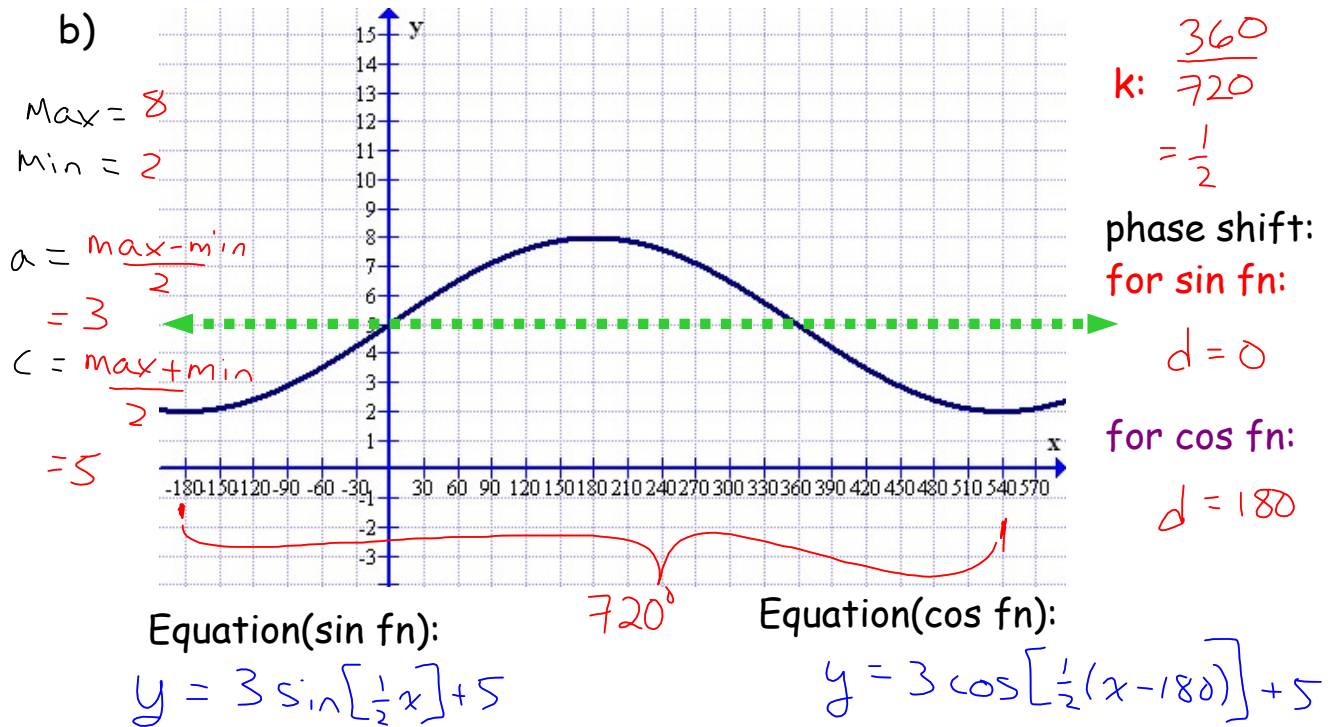
$$c = 0$$

Equation(sin fn):

$$f(x) = 4 \sin(2x)$$

Equation(cos fn):

$$f(x) = 4 \cos[2(x - 45)]$$



d) Determine the equation of the function that is the simplest model

x	-2	7	16	25	34	43
y	7	10	13	10	7	10

$$\text{Max} = 13$$

$$\text{Min} = 7$$

$$a = \frac{\text{Max} - \text{Min}}{2}$$

$$= 3$$

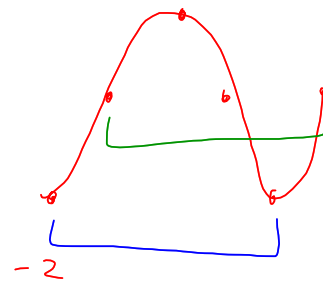
$$c = \frac{\text{Max} + \text{Min}}{2}$$

$$= 10$$

One cycle
36 units

$$k = \frac{360}{36}$$

$$= 10$$



Simplest? Negative cos : min, middle, max,
middle, min

$$y = -3\cos[10(x+2)] + 10$$

Homework:

p 391 # 4a, 5, 6, 7, 10, 13