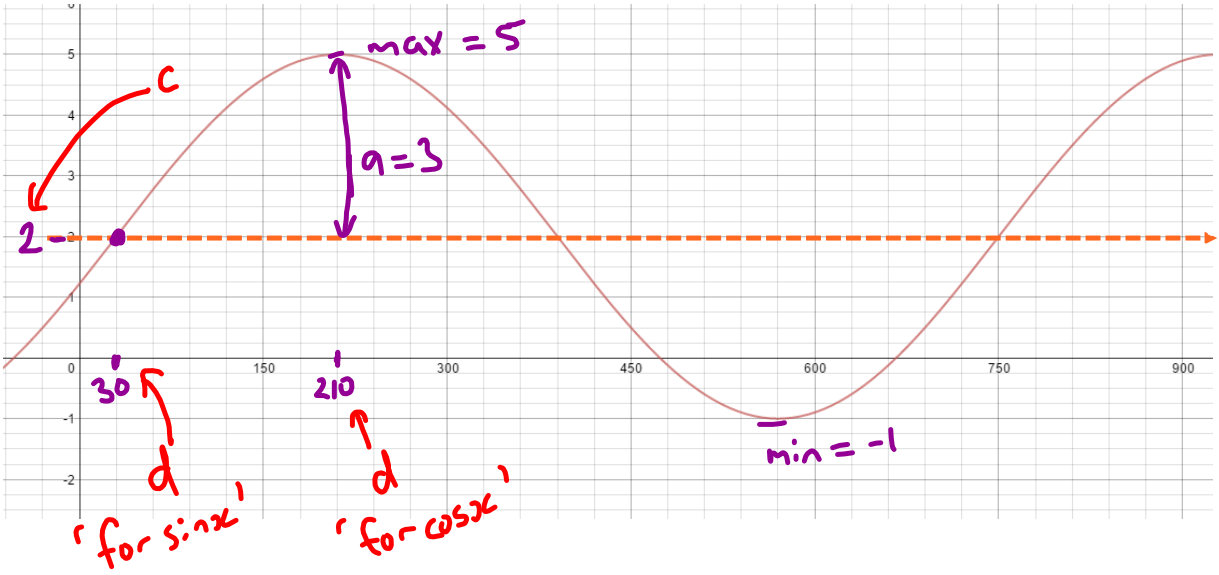
intro to 6.6



Write the equation of the function: ($y = a\sin[K(x-d)] + c$ or $y = a\cos[K(x-d)] + c$)

a) as a transformation of the base function y=sin x

amplitude (a) $= \frac{\text{max} - \text{min}}{2}$

$= \frac{5-(-1)}{2}$

$= 3$

equation of axis (c) $= \frac{\text{max} + \text{min}}{2}$

$= \frac{5+(-1)}{2}$

$= 2$

Period $= \frac{360}{K}$

$K = \frac{360}{\text{period}}$

$= \frac{360}{720}$

$= \frac{1}{2}$

$d = 30°$

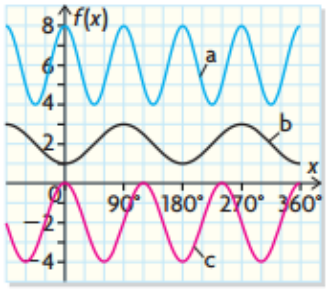
$\therefore$ Equation is $y = 3\sin\left[\frac{1}{2}(x-30°)\right] + 2$

b) as a transformation of the base function y=cos x

$y = 3\cos\left[\frac{1}{2}(x-210°)\right] + 2$

homework: try p391 # 1 - 6

CHECK Your Understanding



1. Determine an equation for each sinusoidal function at the right.
2. Determine the function that models the data in the table and does not involve a horizontal translation.

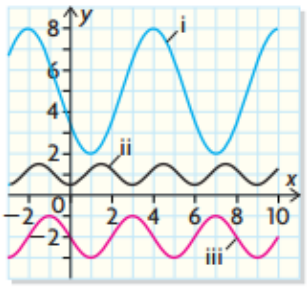
x	0°	45°	90°	135°	180°	225°	270°
y	9	7	5	7	9	7	5

3. A sinusoidal function has an amplitude of 4 units, a period of 120°, and a maximum at (0, 9). Determine the equation of the function.

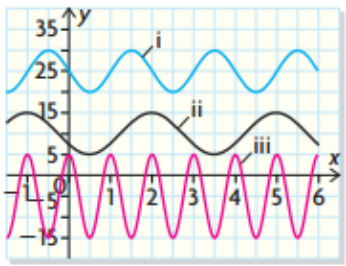
PRACTISING

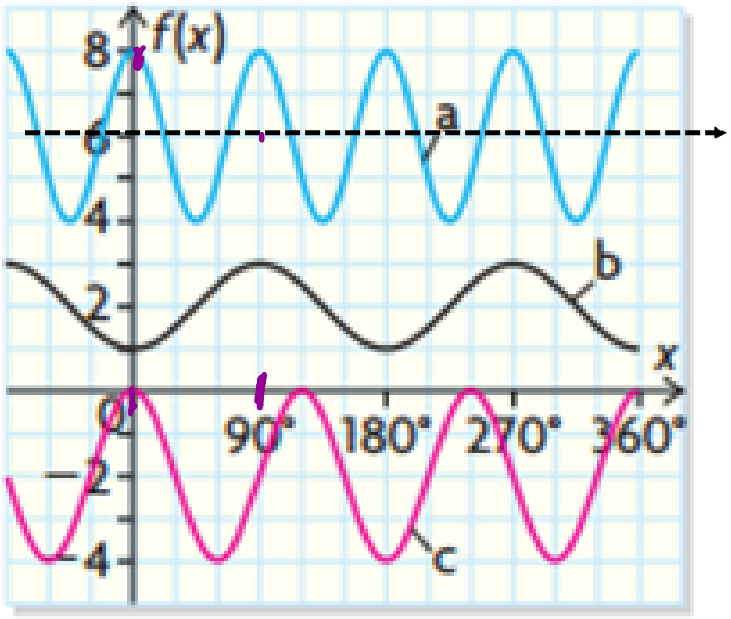
4. Determine the equation for each sinusoidal function.

a)



b)





1. Answers may vary. For example,
   a) $y = 2\cos(4x) + 6$
   b) $y = \cos(2(x - 90°)) + 2$
   c) $y = 2\cos(3x) - 2$
2. $y = 2\cos(2x) + 7$
3. Answers may vary. For example, $y = 4\cos(3x) + 5$
4. Answers may vary. For example,
   a) i) $y = 3\cos(60(x - 4°)) + 5$;
   ii) $y = -0.5\cos(120x) + 1$;
   iii) $y = \cos(90(x - 3°)) - 2$
   b) i) $y = 5\cos(180(x - 1.5°)) + 25$;
   ii) $y = 5\cos(120(x - 2°)) + 10$;
   iii) $y = 10\cos(360x) - 5$
5. a) $y = \cos(3x) + 17$
   b) $y = -4\cos(0.5x) + 2$
   c) $y = 3\sin(1.5x) - 4$
   d) $y = 3\cos(3(x - 10°)) + 2$
6. a) $y = 3\cos x + 11$
   b) $y = 4\cos(2(x - 30°)) + 15$
   c) $y = 2\cos(9(x - 7°))$
   d) $y = 0.5\cos\left(\left(\frac{1}{2}\right)(x + 56°)\right) - 3$

5. For each table of data, determine the equation of the function that is the simplest model.

a)

x	0°	30°	60°	90°	120°	150°	180°
y	3	2	1	2	3	2	1

b)

x	−180°	0°	180°	360°	540°	720°	900°
y	17	13	17	21	17	13	17

c)

x	−120°	−60°	0°	60°	120°	180°	240°
y	−4	−7	−4	−1	−4	−7	−4

d)

x	−20°	10°	40°	70°	100°	130°	160°
y	2	5	2	−1	2	5	2

6. K Determine the equation of the cosine function whose graph has each of the following features.

	Amplitude	Period	Equation of the Axis	Horizontal Translation
a)	3	360°	$y = 11$	0°
b)	4	180°	$y = 15$	30°
c)	2	40°	$y = 0$	7°
d)	0.5	720°	$y = -3$	−56°

2. Create a graph of the function $y=\frac{1}{2}\cos\left[\frac{1}{2}(x-30°)\right]-2$ for two cycles

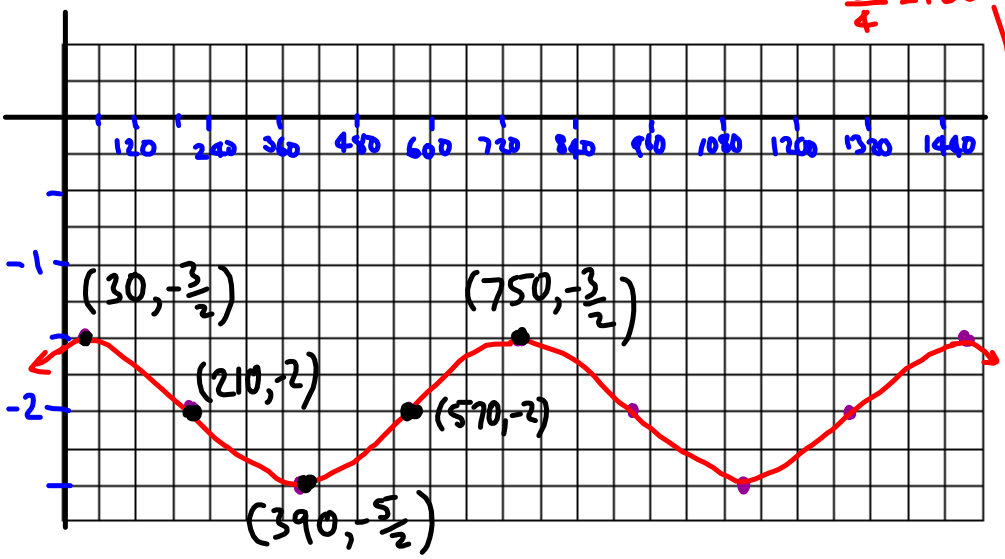
amplitude $=\frac{1}{2}$

phase shift $=30$

eqn of axis $=-2$

period $=\frac{360}{K}$ $= 360 \div \frac{1}{2}$ $= 720$

$\frac{720}{4}=180$



Key Points

$(30, -\frac{3}{2})$ +180

$(210, -2)$

$(390, -\frac{5}{2})$

$(570, -2)$

$(750, -\frac{3}{2})$

	x	y
R		
S	2	$\frac{1}{2}$
T	30	-2

$y = \cos x$ $\qquad$ $y=\frac{1}{2}\cos\left[\frac{1}{2}(x-30°)\right]-2$

$(0, 1) \rightarrow (30, -\frac{3}{2})$

$(90, 0) \rightarrow (210, -2)$

$(180, -1) \rightarrow (390, -\frac{5}{2})$

$(270, 0) \rightarrow (570, -2)$

$(360, 1) \rightarrow (750, -\frac{3}{2})$