/17K	/21A	/3C	/9T	Total	/50

Name: Answers Date: _____

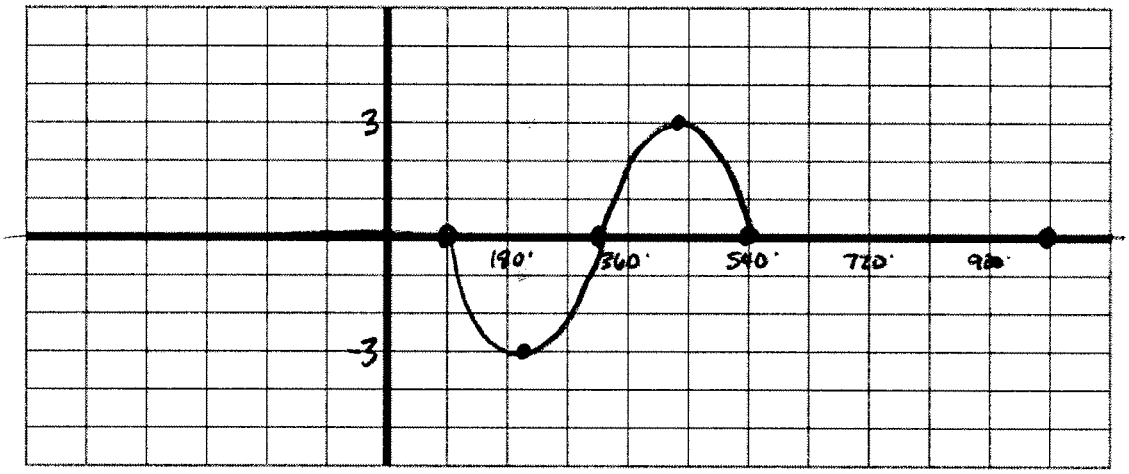
MCR3U Unit 5 Test: Trigonometric functions

Show all related work – support your answers by showing your process!

/3 K

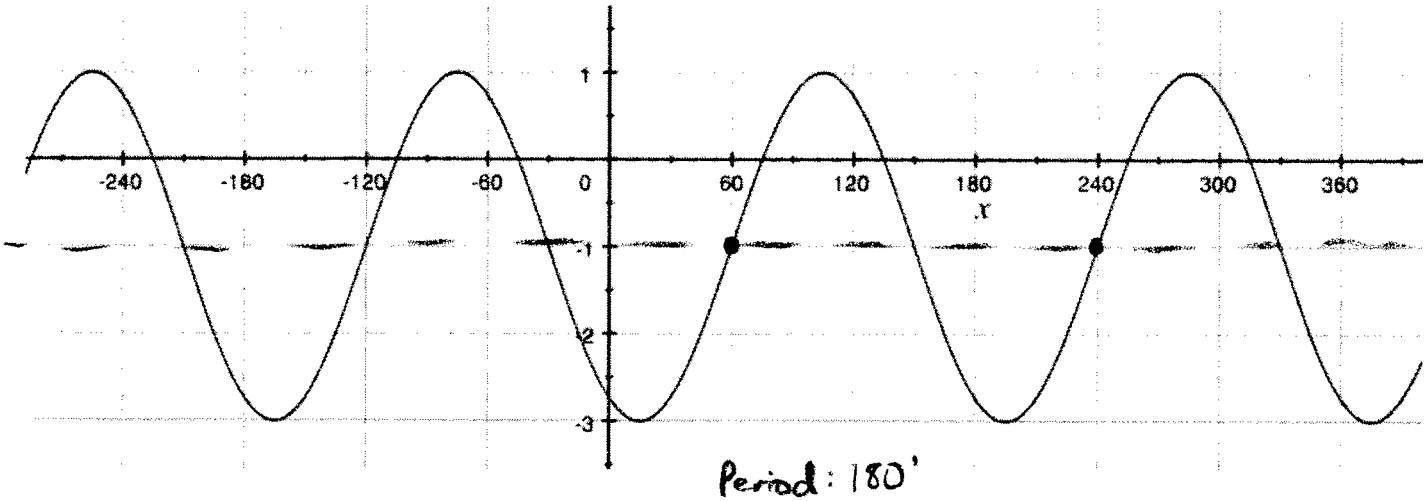
1. Sketch one cycle of the graph of $y = -3\sin\left[\frac{4}{5}(x-90^\circ)\right]$. Include an appropriate scale on each axis.

Period: $\frac{360^\circ}{(4/5)} = 450^\circ$



/3 A

2. Write an equation to represent the sinusoidal function in the following graph.



Period: 180°

$k = \frac{360^\circ}{180^\circ} = 2$

$y = 2\sin[2(x-60^\circ)] - 1$

/2 C

3. What is the phase shift (and direction) of the cosine curve $y=2\cos(0.5x-100^o)$?

$=2\cos[0.5(x-200^\circ)]$

200° right

/2 K

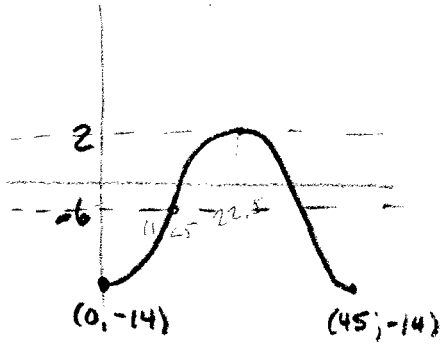
4. Determine the period of the function $y=60\sin\left[\frac{10}{7}(x-360^o)\right]+120$?

Period $= \frac{360^\circ}{(10/7)} = 252^\circ$

/3 T

5. A sinusoidal function has an amplitude of 8 units, a period of 45°, and a minimum at (0, –14). Represent the function with an equation using a sine or cosine function.

$k = \frac{360^\circ}{45^\circ} = 8$



$y = -8\cos[8x]-6$

$= -8\sin[8(x-11.25^\circ)]-6$

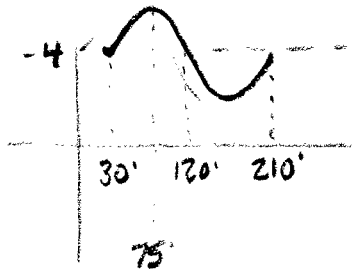
$= -8\sin[8(x+11.25^\circ)]-6$

$= 8\cos[8(x-22.5^\circ)]-6$

/3 T

6. Give the **co-ordinates** of a maximum of the graph of $f(x)=\sin[2(x-30^o)]+4$. Use this information to determine an equivalent equation using a cosine function.

Period = 180°



∴ Maximum at (75°, 5)

$\therefore\ y = \cos[2(x-75^\circ)]+4$

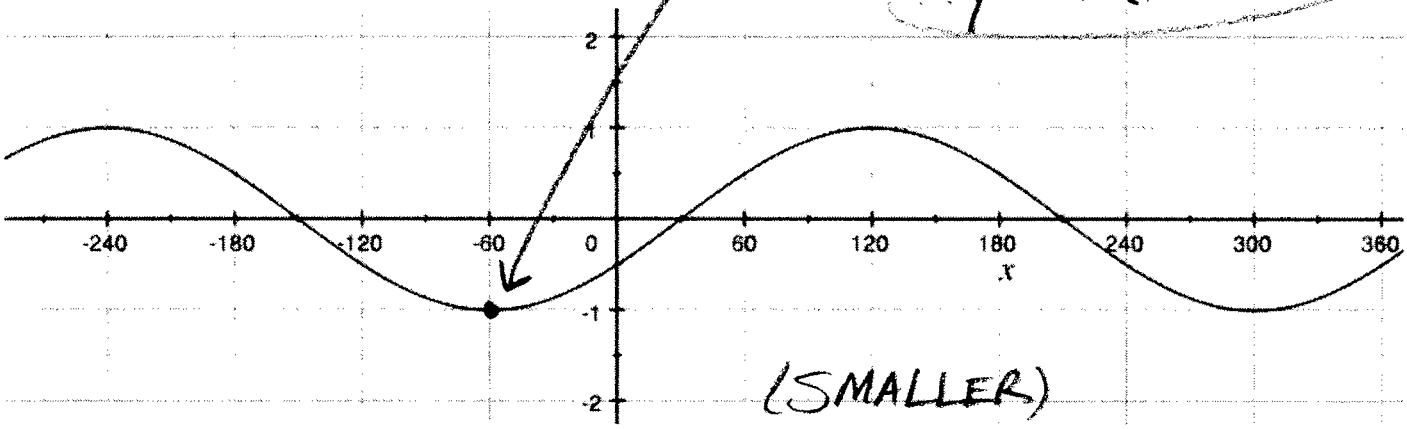
/2
C

7. Is this the curve $y = -\cos(x - 60^\circ)$?

If it is, provide evidence to support it.
If it isn't, explain why it isn't.

-cos starts here. Phase shift 60° left

$\therefore y = -\cos(x + 60^\circ)$



(SMALLER)

/4
K

8. Determine equations to model each of the following sinusoidal functions.

a) Amp: 3

V. Shift: Up 1

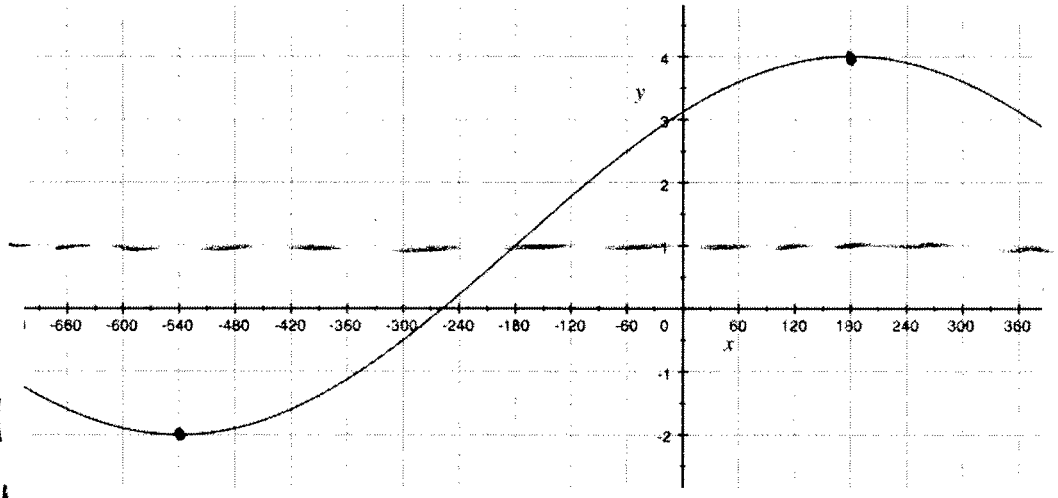
Period: $2 \times (540^\circ + 180^\circ) = 1440$

$k = \frac{360^\circ}{1440^\circ} = \frac{1}{4}$

P. Shift: 180° left

$y = 3\sin\left[\frac{1}{4}(x + 180)\right] + 1$

$y = 3\cos\left[\frac{1}{4}(x + 180)\right] + 1$



b)

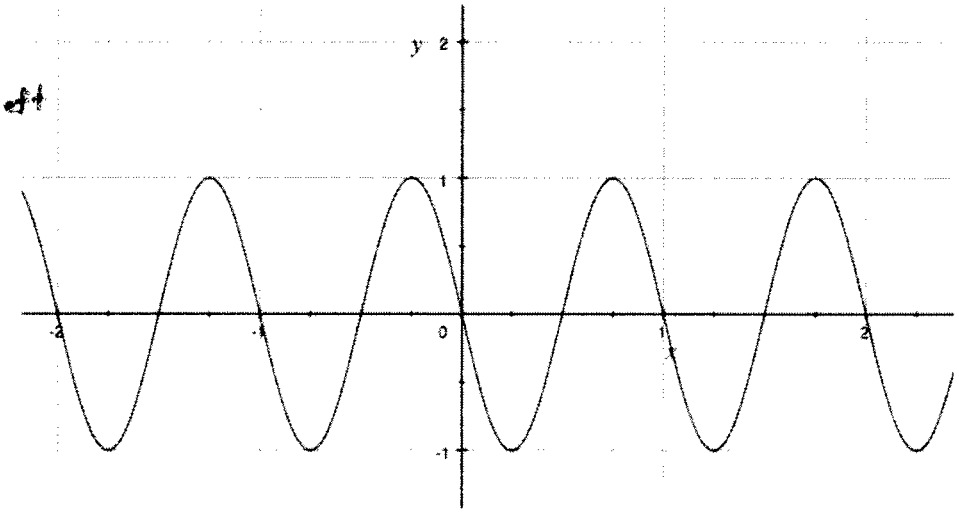
Amp: 1 P Shift: 0.5 left

V. Shift: 0

Period: 1 $k = \frac{360^\circ}{1} = 360$

$y = \sin[360(x + 0.5)]$

$y = \cos[360(x + 0.25)]$



9. The following table lists average monthly high temperatures (°C) in St. John's NF for one year.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
47	52	62	72	79	87	93	93	84	74	60	50

/4 A

a) Determine a **sine** (not cosine!) equation to model this data.

Amp: $\frac{93-47}{2} = 23$

V.Shift: $\frac{93+47}{2} = 70$

Period: 12 $(k = 30)$

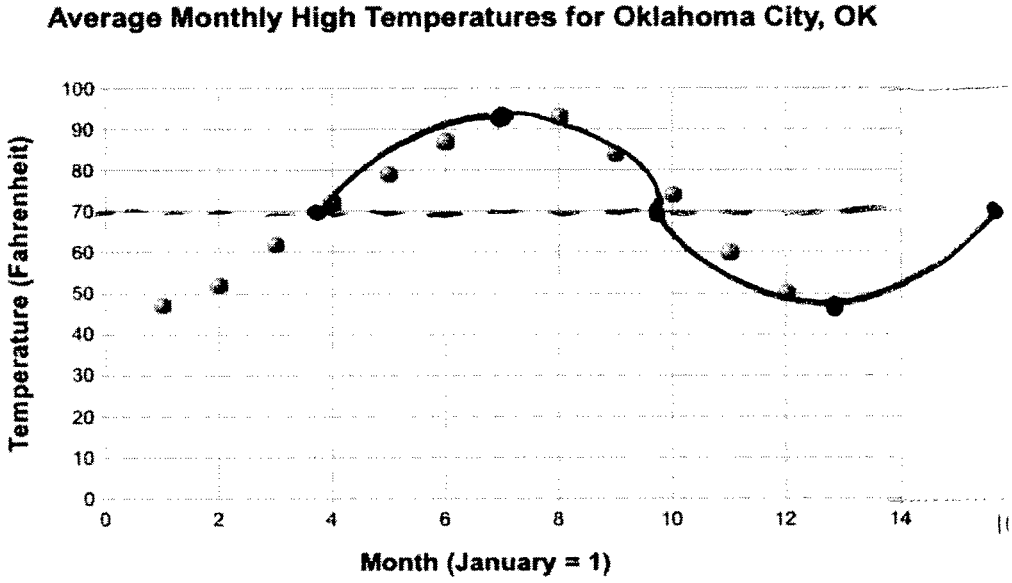
P Shift: 3.7 right

$y = 23 \sin[30(x-3.7)] + 70$

$y = 23 \cos[30(x-7.5)] + 70$

/1 C

b) Graph the equation below.



/2 A

c) Determine an equivalent **cosine** function that models this data.

Max at (7, 93)

$y = 23 \cos[30(x-7)] + 70$

/5
A

10. The depth of water h, in metres, in a given location on a given day at t hours after midnight can be modelled using the sinusoidal function $h(t)=1.8\cos[30°(t-2)]+5.7$.

a) What are the maximum and minimum depths, of the water ?

Max: $5.7+1.8=7.5$ m

Min: $5.7-1.8=3.9$ m

b) Determine a time at which low tide occurs.

cos: max at $t=2$, $t=14$ (since Period is 12)

∴ min at $t=8$

c) What is the depth of the water at 8 PM?

$\Rightarrow t=20$

$h=1.8\cos[30(20-2)]+5.7$

$=3.9$ m

/3
T

11. Find the equation of a sinusoidal function that fits the following specifications:

- A maximum at $(45°, 7)$
- The **next** maximum at $(60°, 7)$
- The minimum of the function is -13

Period $15°$ $\longrightarrow$ $k=\frac{360°}{15°}=24$

V Shift: $\frac{7+(-13)}{2}=-3$

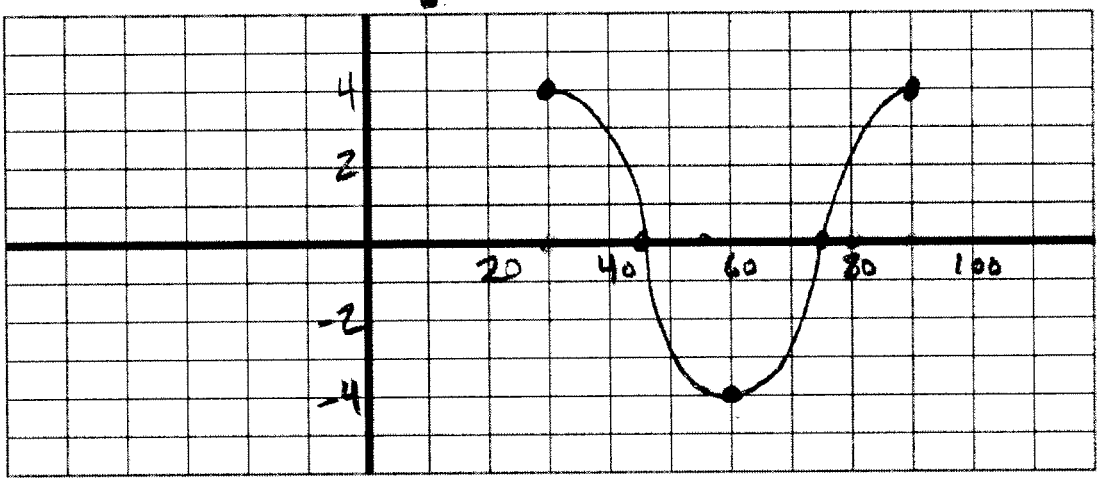
Amp: $\frac{7-(-13)}{2}=10$

$y=10\cos[24(x-45°)]-3$

/4
A

12. Sketch the function $h(x)=4\cos[\frac{6}{1}(x-30^\circ)]$. Include an appropriate scale on both axes.

one cycle = Period : $\frac{360^\circ}{6} = 60^\circ$



/1
C

13. Describe the difference between **period** and **k**. Do not just give the formulas relating the two.

width of one cycle

the number in the equation