Let $y = -4\cos[2(x-\frac{\pi}{6})]+5$. Fill in the blanks. Simplify your answers.

Middle $y-$value = 5

Amplitude = 4 (1-4)

Maximum $y-$value = 9 (5+4)

Minimum $y-$value = 1 (5-4)

Phase shift = $\frac{\pi}{6}$ $2(x-\frac{\pi}{6})=0$

Period = π $\frac{2\pi}{2}$

Quarter-period = $\frac{\pi}{4}$

Find the $x-$ and $y-$ coordinates for all points corresponding to the middle, top and bottom of the graph of the function for 2 complete cycles, starting at the phase shift. State clearly if the point corresponds to the top, middle or bottom of the graph.

Point 1: $x = \frac{\pi}{6}$ (PHASE SHIFT) or $\frac{2\pi}{12}$ $y = 1$ (BOTTOM) (TOP, MIDDLE or BOTTOM)

Point 2: $x = \frac{2\pi}{12}$ (PREVIOUS $x-$VALUE) + $\frac{\pi}{4}$ or $\frac{3\pi}{12}$ (QUARTER-PERIOD) = $\frac{5\pi}{12}$ $y = 5$ (MIDDLE) (TOP, MIDDLE or BOTTOM)

Point 3: $x = \frac{5\pi}{12}$ (PREVIOUS $x-$VALUE) + $\frac{3\pi}{12}$ (QUARTER-PERIOD) = $\frac{8\pi}{12}$ $y = 9$ (TOP) (TOP, MIDDLE or BOTTOM)

Point 4: $x = \frac{8\pi}{12}$ (PREVIOUS $x-$VALUE) + $\frac{3\pi}{12}$ (QUARTER-PERIOD) = $\frac{11\pi}{12}$ $y = 5$ (MIDDLE) (TOP, MIDDLE or BOTTOM)

Point 5: $x = \frac{11\pi}{12}$ (PREVIOUS $x-$VALUE) + $\frac{3\pi}{12}$ (QUARTER-PERIOD) = $\frac{14\pi}{12}$ $y = 1$ (BOTTOM) (TOP, MIDDLE or BOTTOM)

Point 6: $x = \frac{14\pi}{12}$ (PREVIOUS $x-$VALUE) + $\frac{3\pi}{12}$ (QUARTER-PERIOD) = $\frac{17\pi}{12}$ $y = 5$ (MIDDLE) (TOP, MIDDLE or BOTTOM)

Point 7: $x = \frac{17\pi}{12}$ (PREVIOUS $x-$VALUE) + $\frac{3\pi}{12}$ (QUARTER-PERIOD) = $\frac{20\pi}{12}$ $y = 9$ (TOP) (TOP, MIDDLE or BOTTOM)

Point 8: $x = \frac{20\pi}{12}$ (PREVIOUS $x-$VALUE) + $\frac{3\pi}{12}$ (QUARTER-PERIOD) = $\frac{23\pi}{12}$ $y = 5$ (MIDDLE) (TOP, MIDDLE or BOTTOM)

Point 9: $x = \frac{23\pi}{12}$ (PREVIOUS $x-$VALUE) + $\frac{3\pi}{12}$ (QUARTER-PERIOD) = $\frac{26\pi}{12}$ $y = 1$ (BOTTOM) (TOP, MIDDLE or BOTTOM)

Let $y = 2\sin(\frac{3\pi}{2}x + \frac{9\pi}{8}) + 3$. Fill in the blanks. Simplify your answers.

$\frac{3\pi}{2}x + \frac{9\pi}{8} = 0$

$\frac{3\pi}{2}x = -\frac{9\pi}{8}$

$x = -\frac{9\pi}{8} \cdot \frac{2}{3\pi}$

$\frac{2\pi}{\frac{3\pi}{2}} = 2\pi \cdot \frac{2}{3\pi}$

Middle $y-$value = 3

Amplitude = 2

Maximum $y-$value = 5

Minimum $y-$value = 1

Phase shift = $-\frac{3}{4}$

Period = $\frac{4}{3}$

Quarter-period = $\frac{1}{3}$

Find the $x-$ and $y-$ coordinates for all points corresponding to the middle, top and bottom of the graph of the function for 2 complete cycles, starting at the phase shift. State clearly if the point corresponds to the top, middle or bottom of the graph.

Point 1: $x = \underset{\text{PHASE SHIFT}}{-\frac{3}{4}}$ OR $-\frac{9}{12}$ $\quad y = 3$ (MIDDLE) — TOP, MIDDLE or BOTTOM

Point 2: $x = \underset{\text{PREVIOUS } x-\text{VALUE}}{-\frac{9}{12}} + \underset{\text{QUARTER-PERIOD}}{\frac{1}{3} \text{ OR } \frac{4}{12}} = \frac{-5}{12}$ $\quad y = 5$ (TOP) — TOP, MIDDLE or BOTTOM

Point 3: $x = \underset{\text{PREVIOUS } x-\text{VALUE}}{-\frac{5}{12}} + \underset{\text{QUARTER-PERIOD}}{\frac{4}{12}} = \frac{-1}{12}$ $\quad y = 3$ (MIDDLE) — TOP, MIDDLE or BOTTOM

Point 4: $x = \underset{\text{PREVIOUS } x-\text{VALUE}}{-\frac{1}{12}} + \underset{\text{QUARTER-PERIOD}}{\frac{4}{12}} = \frac{3}{12}$ $\quad y = 1$ (BOTTOM) — TOP, MIDDLE or BOTTOM

Point 5: $x = \underset{\text{PREVIOUS } x-\text{VALUE}}{\frac{3}{12}} + \underset{\text{QUARTER-PERIOD}}{\frac{4}{12}} = \frac{7}{12}$ $\quad y = 3$ (MIDDLE) — TOP, MIDDLE or BOTTOM

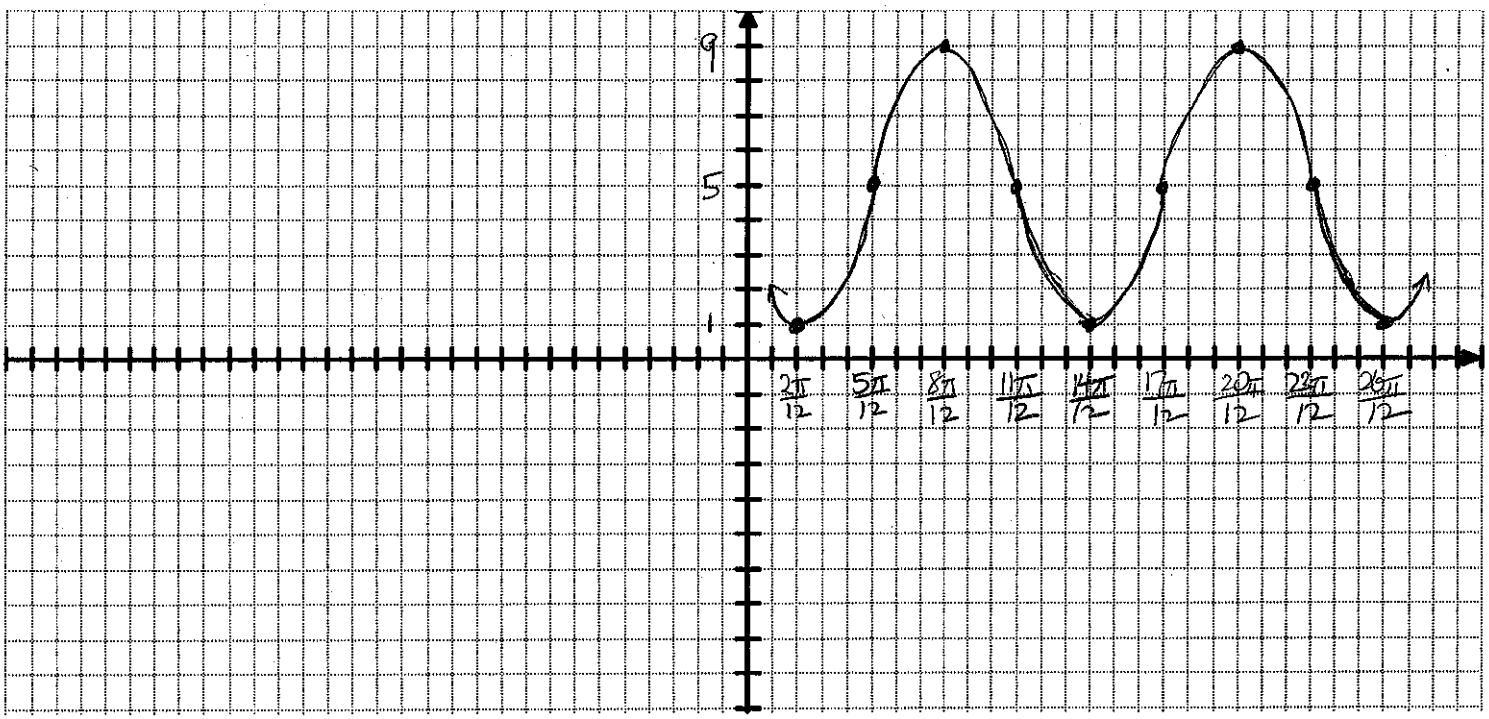
Point 6: $x = \underset{\text{PREVIOUS } x-\text{VALUE}}{\frac{7}{12}} + \underset{\text{QUARTER-PERIOD}}{\frac{4}{12}} = \frac{11}{12}$ $\quad y = 5$ (TOP) — TOP, MIDDLE or BOTTOM

Point 7: $x = \underset{\text{PREVIOUS } x-\text{VALUE}}{\frac{11}{12}} + \underset{\text{QUARTER-PERIOD}}{\frac{4}{12}} = \frac{15}{12}$ $\quad y = 3$ (MIDDLE) — TOP, MIDDLE or BOTTOM

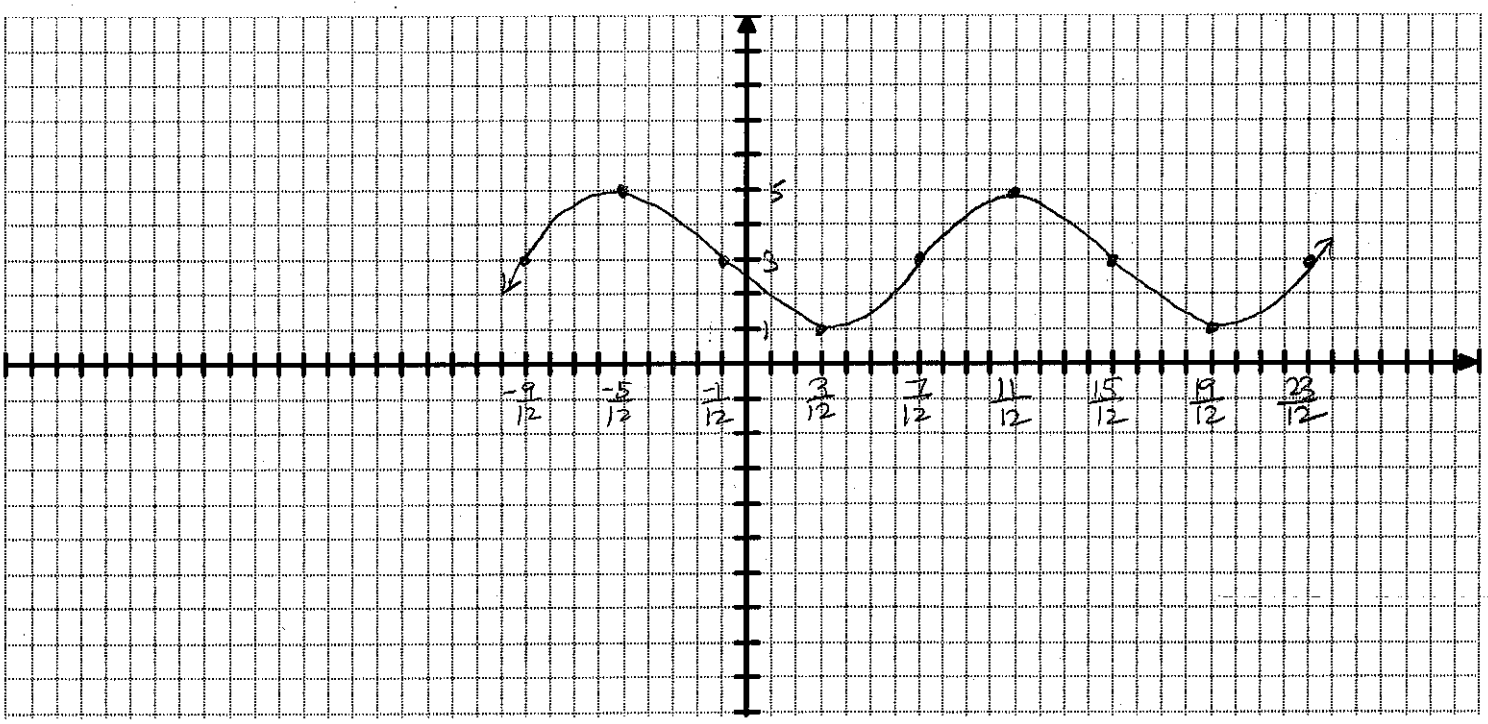
Point 8: $x = \underset{\text{PREVIOUS } x-\text{VALUE}}{\frac{15}{12}} + \underset{\text{QUARTER-PERIOD}}{\frac{4}{12}} = \frac{19}{12}$ $\quad y = 1$ (BOTTOM) — TOP, MIDDLE or BOTTOM

Point 9: $x = \underset{\text{PREVIOUS } x-\text{VALUE}}{\frac{19}{12}} + \underset{\text{QUARTER-PERIOD}}{\frac{4}{12}} = \frac{23}{12}$ $\quad y = 3$ (MIDDLE) — TOP, MIDDLE or BOTTOM

Sketch a detailed graph of 2 complete cycles of $y = -4\cos[2(x - \frac{\pi}{6})] + 5$ using the information from Question 1 Part 1.
You must label all $x-$ and $y-$ values from Part 1 on the appropriate axes below, and you must use a consistent scale for each axis.
You do NOT need to label each tick mark on each axis, only the ones you found in Part 1.



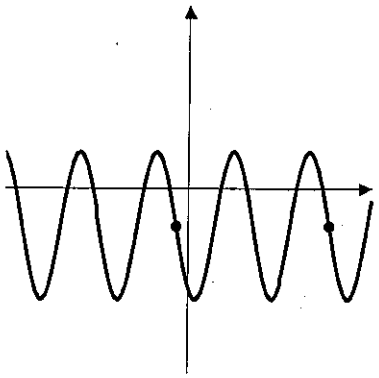
Sketch a detailed graph of 2 complete cycles of $y = 2\sin(\frac{3\pi}{2}x + \frac{9\pi}{8}) + 3$ using the information from Question 2 Part 1.
You must label all $x-$ and $y-$ values from Part 1 on the appropriate axes below, and you must use a consistent scale for each axis.
You do NOT need to label each tick mark on each axis, only the ones you found in Part 1.



Fill in the blanks regarding the graph on the right. Simplify your answers.

NOTE: The $x-$coordinates of the two points highlighted are $-\frac{\pi}{9}$ and $\frac{11\pi}{9}$, and correspond to points with the middle $y-$value.

The maximum and minimum $y-$values are 1 and -3.



Middle $y-$value = $\underline{-1}$ $= D$ $\frac{1+-3}{2}$

Amplitude = $\underline{2}$ $= |A|$ $\frac{1--3}{2}$

Phase shift = $\underline{-\frac{\pi}{9}}$ $= C$

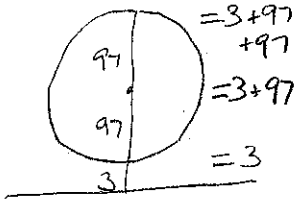
Period = $\frac{1}{2}\left(\frac{11\pi}{9}--\frac{\pi}{9}\right)$ $\underline{\frac{2\pi}{3}}$ $= \frac{2\pi}{B} \Rightarrow B =$ $\underline{3}$

Given the points shown, the equation of the graph is easier to write using a $\underline{\text{NEGATIVE}}$ (POSITIVE or NEGATIVE) $\underline{\text{SIN}}$ (SIN or COS) function,

So, $A =$ $\underline{-2}$.

The equation of the graph is $y =$ $\underline{-2}$ (A) $\underline{\text{SIN}}$ (SIN or COS) $\underline{3}$ (B) $(x-$ $\underline{-\frac{\pi}{9}}$ (C) $)+$ $\underline{-1}$ (D). $-2\sin 3\left(x+\frac{\pi}{9}\right)-1$

You are riding a ferris wheel with a radius of 97 feet, which is turning at a regular rate.
You have a tremendous fear of heights, but you don't want to embarrass yourself in front of your date, so you try to distract yourself by finding an equation for your height (y) as a function of time (t).
At time $t = 43$ seconds, you are at the bottom of the wheel, which is 3 feet above the ground.
At time $t = 60$ seconds, you are at the top of the wheel. (This is the first time you reach the top after $t = 43$ seconds.)
Fill in the blanks. Simplify your answers.



It may be helpful to draw a crude sketch of the height function and label the known $t-$ and $y-$values on it.

Maximum $y-$value = $\underline{197}$

Minimum $y-$value = $\underline{3}$

Middle $y-$value = $\underline{100}$ $= D$

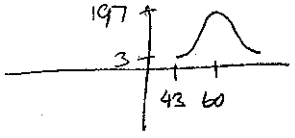
Amplitude = $\underline{97}$ $= |A|$

Phase shift = $\underline{43}$ $= C$

Period = $2(60-43)$ $\underline{34}$ $= \frac{2\pi}{B}$

$B =$ $\underline{\frac{\pi}{17}}$

Given the crude sketch of the height function, the equation is easier to write using a $\underline{\text{NEGATIVE}}$ (POSITIVE or NEGATIVE) $\underline{\text{COS}}$ (SIN or COS) function,



So, $A =$ $\underline{-97}$.

The equation of the function is $y =$ $\underline{-97}$ (A) $\underline{\text{COS}}$ (SIN or COS) $\underline{\frac{\pi}{17}}$ (B) $(t-$ $\underline{43}$ (C) $)+$ $\underline{100}$ (D).