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

Middle y – value = ___ -2 ___

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

Amplitude = ___ 5 ___ $|5|$

Period = ___ π ___ $\frac{2\pi}{2}$

Maximum y – value = ___ 3 ___ $-2 + 5$

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

Minimum y – value = ___ -7 ___ $-2 - 5$

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

$y =$ ___ 3 ___ (TOP)

TOP, MIDDLE or BOTTOM

Point 2: $x =$ ___ $\frac{2\pi}{12}$ ___ + ___ $\frac{3\pi}{12}$ ___ = ___ $\frac{5\pi}{12}$ ___

PREVIOUS x – VALUE

QUARTER– PERIOD

$y =$ ___ -2 ___ (MID)

TOP, MIDDLE or BOTTOM

Point 3: $x =$ ___ $\frac{5\pi}{12}$ ___ + ___ $\frac{3\pi}{12}$ ___ = ___ $\frac{8\pi}{12}$ ___

PREVIOUS x – VALUE

– QUARTER– PERIOD

$y =$ ___ -7 ___ (BOT)

TOP, MIDDLE or BOTTOM

Point 4: $x =$ ___ $\frac{8\pi}{12}$ ___ + ___ $\frac{3\pi}{12}$ ___ = ___ $\frac{11\pi}{12}$ ___

PREVIOUS x – VALUE

QUARTER– PERIOD

$y =$ ___ -2 ___ (MID)

TOP, MIDDLE or BOTTOM

Point 5: $x =$ ___ $\frac{11\pi}{12}$ ___ + ___ $\frac{3\pi}{12}$ ___ = ___ $\frac{14\pi}{12}$ ___

PREVIOUS x – VALUE

QUARTER– PERIOD

$y =$ ___ 3 ___ (TOP)

TOP, MIDDLE or BOTTOM

Point 6: $x =$ ___ $\frac{14\pi}{12}$ ___ + ___ $\frac{3\pi}{12}$ ___ = ___ $\frac{17\pi}{12}$ ___

PREVIOUS x – VALUE

QUARTER– PERIOD

$y =$ ___ -2 ___ (MID)

TOP, MIDDLE or BOTTOM

Point 7: $x =$ ___ $\frac{17\pi}{12}$ ___ + ___ $\frac{3\pi}{12}$ ___ = ___ $\frac{20\pi}{12}$ ___

PREVIOUS x – VALUE

QUARTER– PERIOD

$y =$ ___ -7 ___ (BOT)

TOP, MIDDLE or BOTTOM

Point 8: $x =$ ___ $\frac{20\pi}{12}$ ___ + ___ $\frac{3\pi}{12}$ ___ = ___ $\frac{23\pi}{12}$ ___

PREVIOUS x – VALUE

QUARTER– PERIOD

$y =$ ___ -2 ___ (MID)

TOP, MIDDLE or BOTTOM

Point 9: $x =$ ___ $\frac{23\pi}{12}$ ___ + ___ $\frac{3\pi}{12}$ ___ = ___ $\frac{26\pi}{12}$ ___

PREVIOUS x – VALUE

QUARTER– PERIOD

$y =$ ___ 3 ___ (TOP)

TOP, MIDDLE or BOTTOM

Let $y = -3\sin(\frac{3\pi}{2}x + \frac{9\pi}{8}) + 4$. Fill in the blanks. Simplify your answers.

Middle y – value = _____ 4 _____

Amplitude = _____ 3 _____ $|-3|$

Maximum y – value = _____ 7 _____ $4+3$

Minimum y – value = _____ 1 _____ $4-3$

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

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

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

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

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

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

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

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 = $ _____ $-\frac{3}{4}$ _____
PHASE SHIFT

$y = $ _____ 4 _____ (MID)
TOP, MIDDLE or BOTTOM

Point 2: $x = $ _____ $\frac{-9}{12}$ _____ + _____ $\frac{4}{12}$ _____ = _____ $\frac{-5}{12}$ _____
PREVIOUS x – VALUE   QUARTER– PERIOD

$y = $ _____ 1 _____ (BOT)
TOP, MIDDLE or BOTTOM

Point 3: $x = $ _____ $\frac{-5}{12}$ _____ + _____ $\frac{4}{12}$ _____ = _____ $\frac{-1}{12}$ _____
PREVIOUS x – VALUE   QUARTER– PERIOD

$y = $ _____ 4 _____ (MID)
TOP, MIDDLE or BOTTOM

Point 4: $x = $ _____ $\frac{-1}{12}$ _____ + _____ $\frac{4}{12}$ _____ = _____ $\frac{3}{12}$ _____
PREVIOUS x – VALUE   QUARTER– PERIOD

$y = $ _____ 7 _____ (TOP)
TOP, MIDDLE or BOTTOM

Point 5: $x = $ _____ $\frac{3}{12}$ _____ + _____ $\frac{4}{12}$ _____ = _____ $\frac{7}{12}$ _____
PREVIOUS x – VALUE   QUARTER– PERIOD

$y = $ _____ 4 _____ (MID)
TOP, MIDDLE or BOTTOM

Point 6: $x = $ _____ $\frac{7}{12}$ _____ + _____ $\frac{4}{12}$ _____ = _____ $\frac{11}{12}$ _____
PREVIOUS x – VALUE   QUARTER– PERIOD

$y = $ _____ 1 _____ (BOT)
TOP, MIDDLE or BOTTOM

Point 7: $x = $ _____ $\frac{11}{12}$ _____ + _____ $\frac{4}{12}$ _____ = _____ $\frac{15}{12}$ _____
PREVIOUS x – VALUE   QUARTER– PERIOD

$y = $ _____ 4 _____ (MID)
TOP, MIDDLE or BOTTOM

Point 8: $x = $ _____ $\frac{15}{12}$ _____ + _____ $\frac{4}{12}$ _____ = _____ $\frac{19}{12}$ _____
PREVIOUS x – VALUE   QUARTER– PERIOD

$y = $ _____ 7 _____ (TOP)
TOP, MIDDLE or BOTTOM

Point 9: $x = $ _____ $\frac{19}{12}$ _____ + _____ $\frac{4}{12}$ _____ = _____ $\frac{23}{12}$ _____
PREVIOUS x – VALUE   QUARTER– PERIOD

$y = $ _____ 4 _____ (MID)
TOP, MIDDLE or BOTTOM

Sketch a detailed graph of 2 complete cycles of $y = 5\cos[2(x - \frac{\pi}{6})] - 2$ 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.
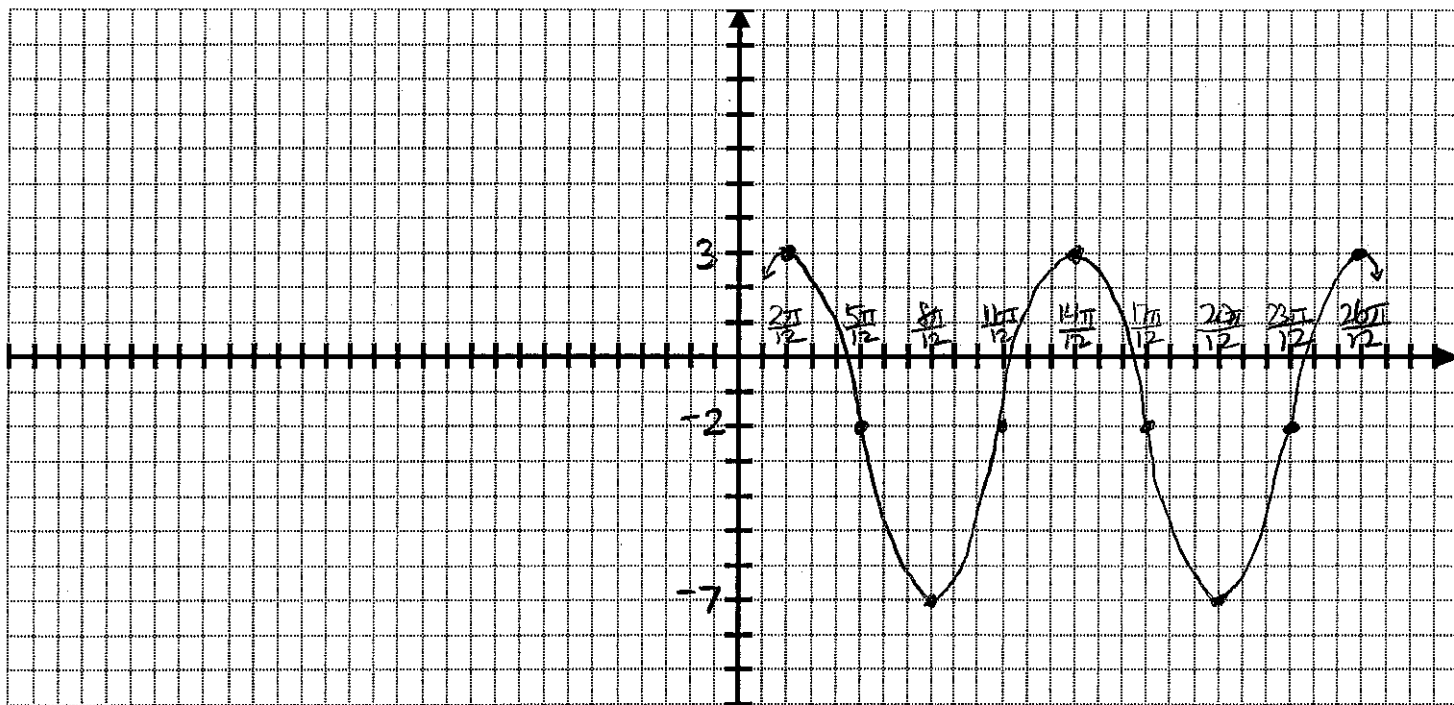
Sketch a detailed graph of 2 complete cycles of $y = -3\sin(\frac{3\pi}{2}x + \frac{9\pi}{8}) + 4$ using the information from Question 2 Part 1.

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.
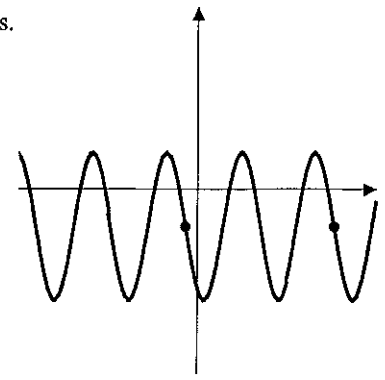
You do NOT need to label each tick mark on each axis, only the ones you found in Part 1.
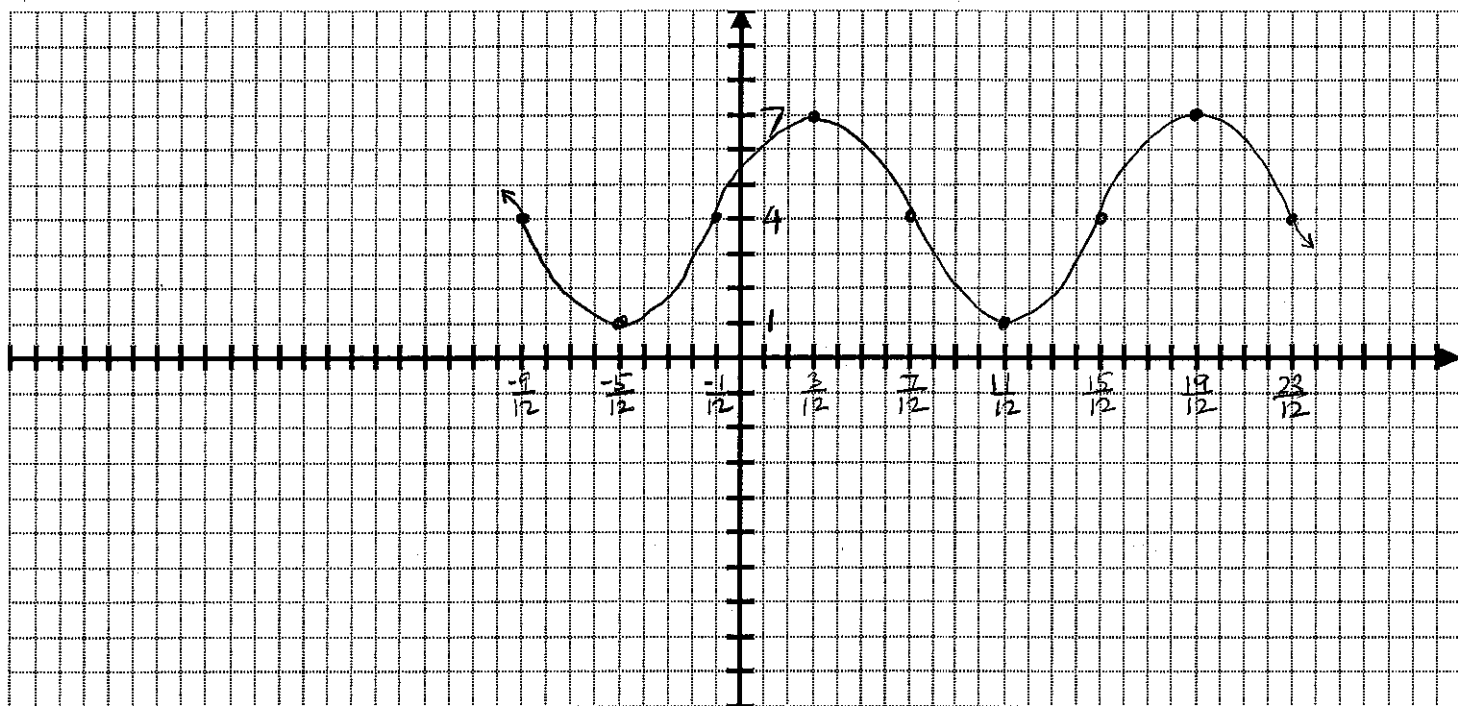
Fill in the blanks regarding the graph on the right (which is NOT drawn to scale). Simplify your answers.

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 2 and -5.

Middle y − value = $\underline{\quad -\frac{3}{2} \quad}$ = D $\quad \frac{2+(-5)}{2}$

Amplitude = $\underline{\quad \frac{7}{2} \quad}$ = |A| $\quad \frac{2-(-5)}{2}$

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

Period = $\underline{\quad \frac{2\pi}{3} \quad}$ = $\frac{2\pi}{B}$ $\Rightarrow$ B = $\underline{\quad 3 \quad}$ $\qquad 2P = \frac{11\pi}{9} - \frac{-\pi}{9} = \frac{4\pi}{3}$

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

So, $A = \underline{\quad -\frac{7}{2} \quad}$.

The equation of the graph is $y = \underline{\quad -\frac{7}{2} \quad} \underline{\quad \text{Sin} \quad} \underline{\quad 3 \quad} (x - \underline{\quad -\frac{\pi}{9} \quad}) + \underline{\quad -\frac{3}{2} \quad}$. $= -\frac{7}{2} \text{Sin } 3(x + \frac{\pi}{9}) - \frac{3}{2}$
$\qquad\qquad\qquad\qquad\qquad\quad$ A $\quad$ SIN or $\quad$ B $\qquad\qquad$ C $\qquad\qquad$ D
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ COS

You are riding a ferris wheel with a radius of 84 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 $t = 12$ seconds, you are at the bottom of the wheel, which is 4 feet above the ground.
At time $t = 27$ seconds, you are at the top of the wheel. (This is the first time you reach the top after time $t = 12$ 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.
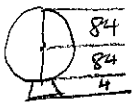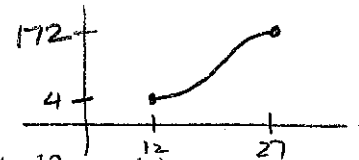
Maximum y − value = $\underline{\quad 172 \quad}$ $\qquad\qquad$ Phase shift = $\underline{\quad 12 \quad}$ = C

Minimum y − value = $\underline{\quad 4 \quad}$ $\qquad\qquad$ Period = $\underline{\quad 30 \quad}$ = $\frac{2\pi}{B}$ $\quad \frac{1}{2}P = 27-12$
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad = 15$
Middle y − value = $\underline{\quad 88 \quad}$ = D $\quad \frac{172+4}{2}$ $\qquad\qquad$ B = $\underline{\quad \frac{\pi}{15} \quad}$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad 30B = 2\pi$
Amplitude = $\underline{\quad 84 \quad}$ = |A| $\quad \frac{172-4}{2}$

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

So, $A = \underline{\quad -84 \quad}$.

The equation of the function is $y = \underline{\quad -84 \quad} \underline{\quad \text{cos} \quad} \underline{\quad \frac{\pi}{15} \quad} (t - \underline{\quad 12 \quad}) + \underline{\quad 88 \quad}$.
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad A \qquad$ SIN or $\quad$ B $\qquad\quad$ C $\qquad\quad$ D
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad$ COS