SCORE: ___ / 20 POINTS

What day of the month is your birthday ? ___ ___
What are the last 2 digits of your address ? ___ ___
What are the last 2 digits of your zip code ? ___ ___
What are the last 2 digits of your social security number ? ___ ___
[IF YOU DO NOT HAVE A SOCIAL SECURITY NUMBER, USE YOUR STUDENT ID NUMBER]

Sketch two full periods of the graph of $y = -3\cos(3\pi x - \pi) + 2$.
Label the 3 y-coordinates and 9 x-coordinates discussed in class.

SCORE: ___ / 11 POINTS

$\text{PERIOD} = \dfrac{2\pi}{3\pi} = \dfrac{2}{3}$ $\dfrac{1}{4}\text{PERIOD} = \dfrac{1}{6}$
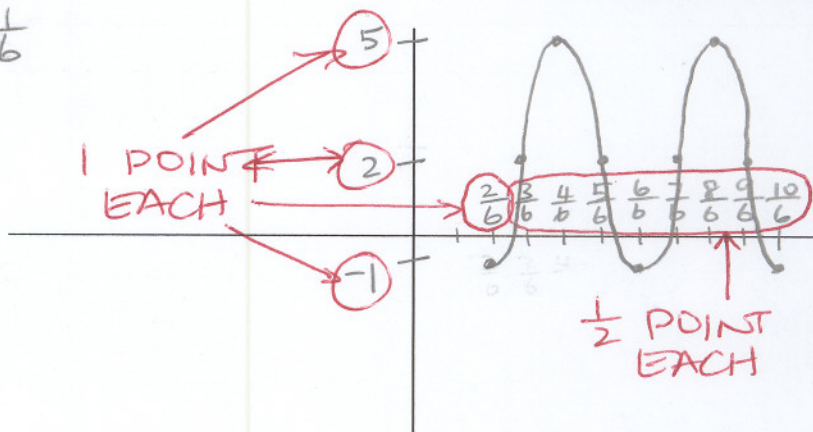
$\text{AMPLITUDE} = |-3| = 3$

$\text{MIDLINE} = 2$

$\text{START} = -\dfrac{(-\pi)}{3\pi} = \dfrac{1}{3}$

DIRECTION ⌒

$\dfrac{1}{3} + \dfrac{1}{6} = \dfrac{2}{6} + \dfrac{1}{6} = \dfrac{3}{6}$

$\dfrac{3}{6} + \dfrac{1}{6} = \dfrac{4}{6}$

$\dfrac{5}{6} \quad \dfrac{6}{6} \quad \dfrac{7}{6} \quad \dfrac{8}{6} \quad \dfrac{9}{6} \quad \dfrac{10}{6}$

⑤   ②   ⊝①   (red annotations)
I POINT EACH
$\frac{2}{6} \frac{3}{6} \frac{4}{6} \frac{5}{6} \frac{6}{6} \frac{7}{6} \frac{8}{6} \frac{9}{6} \frac{10}{6}$
$\frac{1}{2}$ POINT EACH

CORRECT SHAPE FOR COS — 2 POINTS
"UPSIDE DOWN" DIRECTION — 1 POINT

A Ferris Wheel is built such that the height h (in yards) above ground of a seat on the wheel at time t (in seconds) can be modeled by

$$h(t) = 18 + 17\cos\left(\dfrac{t}{4} - \dfrac{3}{2}\right).$$

SCORE: ___ / 5 POINTS

$1\frac{1}{2}$ POINTS $\frac{1}{2}$ POINT   1 POINT

[a] What is the period of the model ? What does the period tell you about the ride ? **(Give the correct units.)**

$\dfrac{2\pi}{\frac{1}{4}} = \boxed{8\pi}$ SECONDS = TIME FOR WHEEL TO GO AROUND ONCE (TIME FOR 1 REVOLUTION)

[b] What is the amplitude of the model ? What does the amplitude of the model tell you about the ride ? **(Give the correct units.)**

$\frac{1}{2}$ POINT EACH $\boxed{17}$ YARDS = RADIUS OF WHEEL ← 1 POINT

Throughout the day, the depth of water at the end of a dock in Bar Harbor, Maine varies with the tides. The table shows the depths (in meters) at various times during the morning. Branca wants to find a trigonometric function to model the data.   **SCORE:** ___ / 4 POINTS
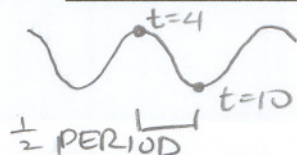
Time, t	Midnight	2 am	4 am	6 am	8 am	10 am	Noon
Depth, y	0.92	2.60	3.33	2.41	0.97	0.09	0.88

[a] What is the amplitude of Branca's function ? **(Give the correct units.)** Show the calculation(s) you used to find the answer.

MAX $y = 3.33$ AMPLITUDE $= \boxed{\frac{1}{2}(3.33 - 0.09)}$
MIN $y = 0.09$ $= \frac{1}{2}(3.24) = \boxed{1.62}$ METERS

[b] What is the period of Branca's function ? **(Give the correct units.)** Show the calculation(s) you used to find the answer.

MAX @ $t = 4$
MIN @ $t = 10$

$\frac{1}{2}$ PERIOD

PERIOD $= \boxed{2(10-4)} = 2(6)$
$= \boxed{12}$ HOURS ← $\frac{1}{2}$ POINT EACH

1 POINT EACH