

Name: Answer Key

Math 1410: Quiz 3

Please show all your work for computations, and write your final answers in the boxes.

2.5 pts

1. Consider the wave given by the function

$$f(x) = -3 \sin(2x) + 4.$$

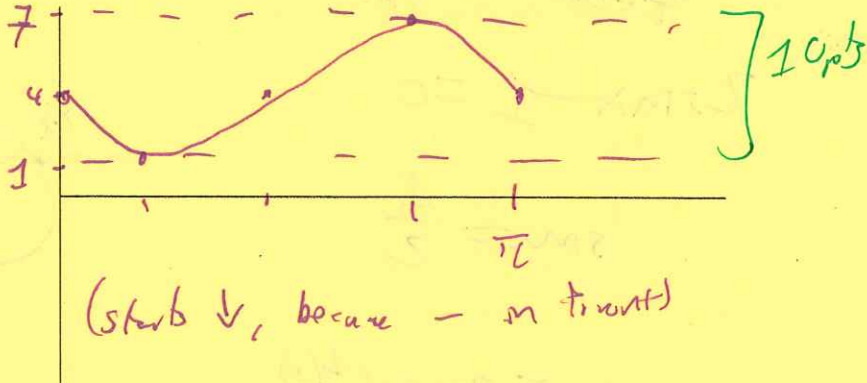
Determine the amplitude, period, and vertical shift of $f(x)$. Sketch a graph of $f(x)$, showing one full period.

5 pts each

amplitude 3

period $\frac{2\pi}{2} = \pi$

vertical shift 4

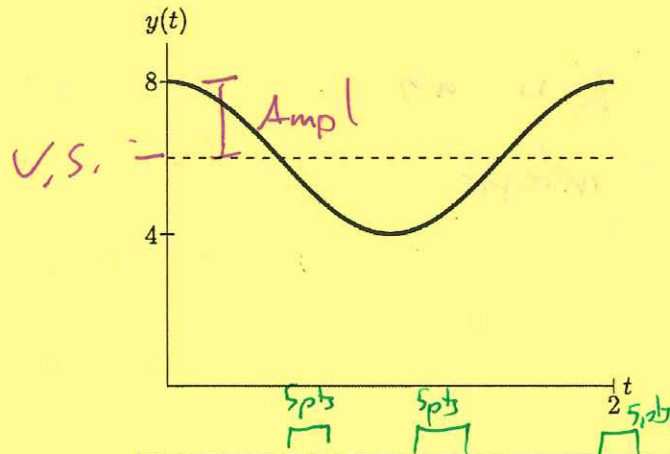


2.5 pts

2. A fly sits on the outside of a vertical gear, which rotates at a constant rate. When at the bottom of the gear the fly is 4 inches above the ground and when at the top the fly is 8 inches above the ground. At time $t = 0$ seconds the fly is at the top, and it takes 2 seconds for it to make a complete cycle and return to its original position, as in the graph. Write an equation in the form

$$y(t) = A \cos(Bt) + C$$

which describes the height $y(t)$, in inches, of the fly above the ground as a function of time t , in seconds.



$$V.S. = \frac{8+4}{2} = 6$$

$$Ampl = 8-6 = 2$$

$$(or: Ampl = \frac{8-4}{2} = 2)$$

$$period = 2$$

$$B = \frac{2\pi}{2} = \pi$$

$y(t) = 2 \cos(\pi t) + 6$

(+ in front because starts at top) 5 pts

30 pts

3. Consider the function $g(x) = 2\sin(x) - 1$. Find the initial value of $g(x)$ and all zeroes of $g(x)$. [Hint: $g(x)$ has infinitely many zeroes.]

10 pts

initial value	-1
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$$g(0) = 2\sin(0) - 1 = 0 - 1 = -1$$

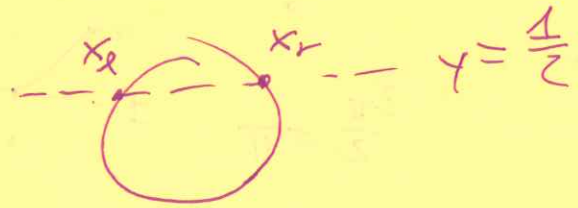
15 pts each solution

10 pts for $2\pi k$

zeroes	$\frac{\pi}{6} + 2\pi k$, k is an integer $\frac{5\pi}{6} + 2\pi k$
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$$2\sin x - 1 = 0$$

$$\sin x = \frac{1}{2}$$



$$x_r = \arcsin\left(\frac{1}{2}\right) = \frac{\pi}{6}$$

$$x_l = \pi - x_r = \frac{5\pi}{6}$$

General solution:

$$x = \frac{\pi}{6} + 2\pi k, \text{ or } \frac{5\pi}{6} + 2\pi k$$

k is an integer