

Directions: Relax – you can do this. Unless you haven't been doing the homework. Then probably you can't. Doh.

1. I gotta be honest, dudes: I'm kinda wiped tonight, so instead of dreaming up an amusing story to introduce the velocity problem, I'll just say that some damn object is moving, and its position in yards away from where it started is described by the function

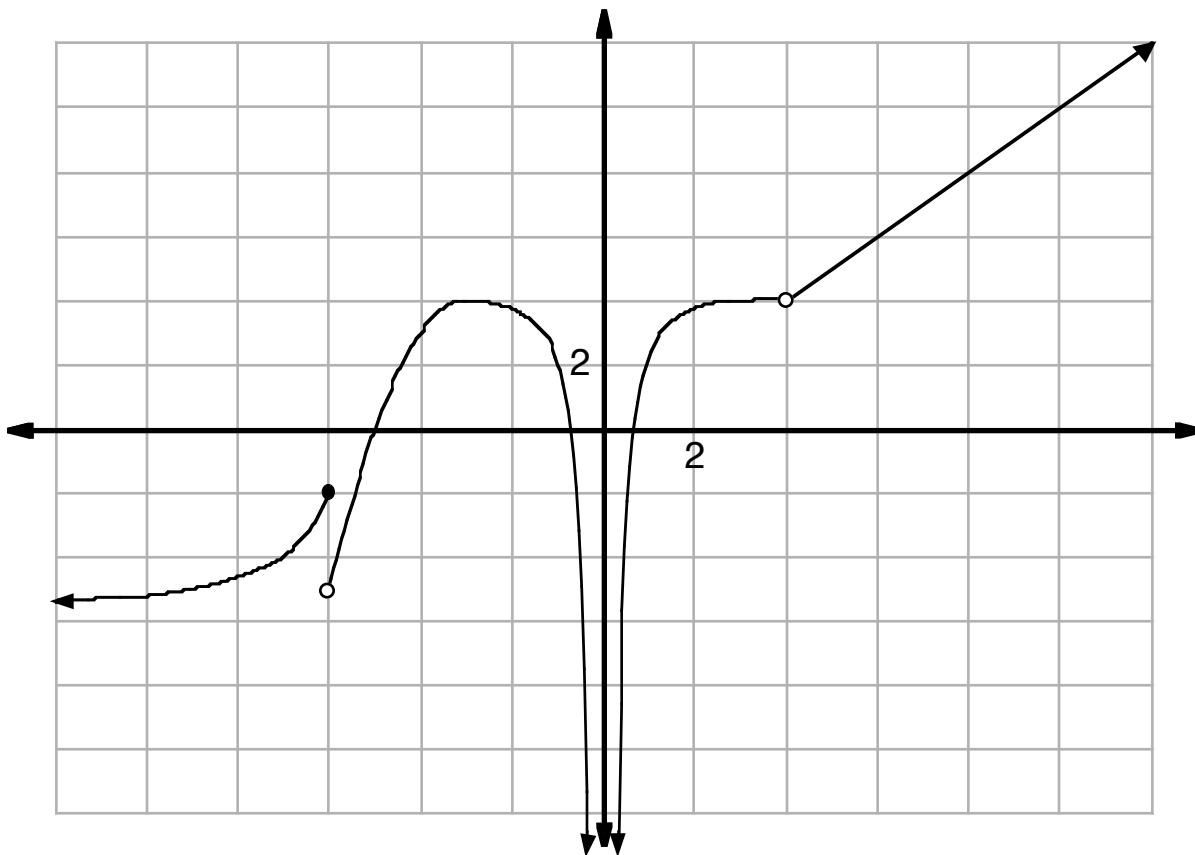
$s(t) = 8.2t^2 + 11.1t$, where t is seconds after the motion started.

a) Find the exact instantaneous velocity at the 6 second mark. For ANY credit, you must use the velocity formula we developed in class. (8 points)

b) Find the average velocity of the object on the interval from 2 to 8 seconds. (4)

c) Do you think your answer from part (a) would be a good approximation for the instantaneous velocity at the 2 second mark? Why or why not? More detail means better score. (4)

2. For the function $f(x)$ whose graph is below, find the requested limits. (2 pts each)



$$\lim_{x \rightarrow -6^-} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -6^+} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -6} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow 4} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow 0} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -\infty} f(x) = \underline{\hspace{2cm}}$$

3. Find each limit. Make sure I can tell how you got your answer!

(5 each)

a) $\lim_{y \rightarrow 12} \frac{3y+1}{(y-12)^3}$

b) $\lim_{t \rightarrow 4} \frac{t^2 - 4t}{3t^2 - 7t - 20}$

c) $\lim_{x \rightarrow -7} \sqrt{x^2 - 13}$

d) $\lim_{x \rightarrow \infty} \frac{4x^3 - 7x + 1}{2x^2 + 11x^4}$

$$\text{e) Find } \lim_{x \rightarrow -3^+} k(x) \text{ where } k(x) = \begin{cases} \frac{x}{2x-3} & x < -3 \\ \frac{1}{4}x^2 + 5 & x \geq -3 \end{cases}$$

4) Find all x values where the function $k(x)$ in question 3e is NOT continuous. (4)

5) As you know, $\lim_{x \rightarrow 1} (3x + 5) = 8$. (You DO know that, right? Please?)

a) Explain informally what it means to say that the limit is 8. (4)

b) According to the formal definition of limit, the limit being 8 means that for any choice of ε , there is a corresponding δ so that if $|x - 1| < \delta$, then $|(3x + 5) - 8| < \varepsilon$. Explain what this definition says in your own words. If your answer doesn't explain WHY this definition says that the limit as x approaches 4 is 7, it stinks. (5)

6) For the function $f(x) = \frac{10}{x-4}$, find the equation of the tangent line to the graph at the point (2, -5). (9)

Extra credit on next page! Yay.

EXTRA CREDIT: Provide a clever and/or humorous caption to the following delightful cartoon. Up to three points will be awarded, based on the following scale:

3 Points – I laughed out loud

2 Points – I laughed inside or my wife laughed out loud

1 Point – Reasonably amusing

0 Points – No answer, not funny, I don't get it

Points are non-negotiable. If you don't like it, you don't get any damn free points.

