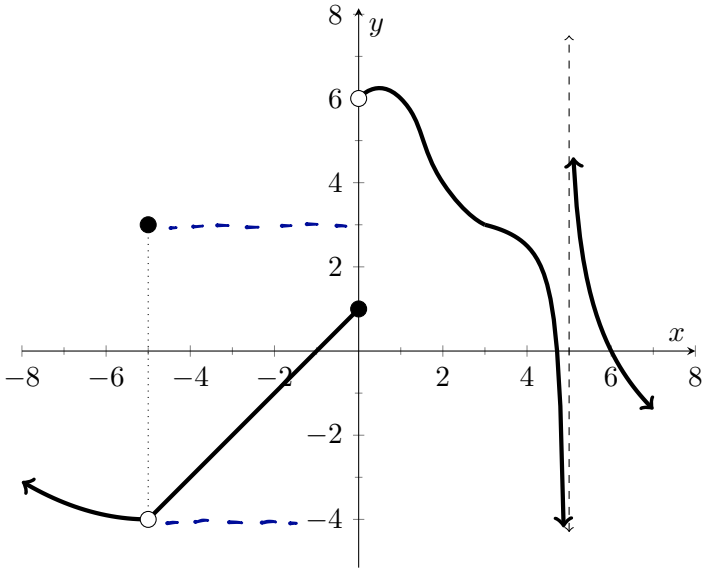
Math 251 Fall 2017 **Quiz #2, September 6**

Name: Solutions

There are 25 points possible on this quiz. This is a closed book quiz. Calculators and notes are not allowed. **Please show all of your work!** If you have any questions, please raise your hand.

Exercise 1. (9 pts.) Use the graph of the function of $f(x)$ to answer the following questions.



1. $\lim_{x\to -5} f(x) =$ -4
2. $\lim_{x\to 0} f(x) =$ DNE
3. $\lim_{x\to 6} f(x) =$ 0
4. $f(-5) =$ 3
5. $f(0) =$ 1
6. $f(6) =$ 0
7. $\lim_{x\to 0^-} f(x) =$ 1
8. $\lim_{x\to 0^+} f(x) =$ 6
9. $\lim_{x\to 5^+} f(x) =$ $+\infty$

Exercise 2. (5 pts.) Evaluate the limit below and justify your answer. **Note:** The 5 points for this problem are distributed as: 1 point for the correct answer, 4 points for a clearly written justification using complete sentences.

$$\lim_{x\to 2^+} \frac{x^2+3}{2-x} = \boxed{-\infty}$$

As x approaches 2 from above, $2-x$ approaches zero but is negative. The numerator approaches $2^2+3=7$, a positive nonzero number. So the quotient is unbounded. Its sign is negative.

Exercise 3. (6 pts.) The position of a car is given by values in the table below. Include units in your answers.

t (seconds)	0	1	2	3	4	5
s (feet)	0	11	32	70	119	179

(a.) Find the average velocity of the car over the time interval $[1, 2]$.

average velocity $= \frac{\Delta s}{\Delta t} = \frac{32-11}{2-1} = 21$ ft/sec

(b.) Find the average velocity of the car over the time interval $[2, 3]$.

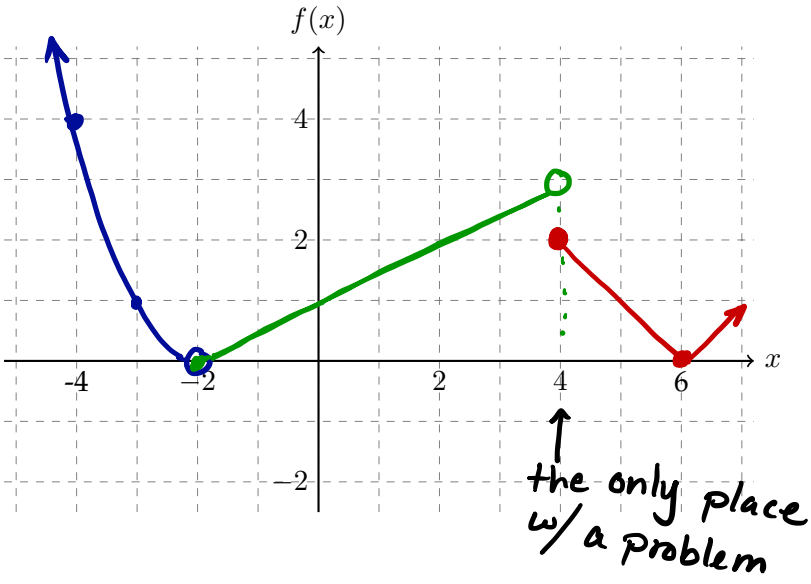
average velocity $= \frac{\Delta s}{\Delta t} = \frac{70-32}{3-2} = \frac{38}{1} = 38$ ft/sec

(c.) Give a rough estimate of the instantaneous velocity at $t = 2$.

average the velocities on left + right $= \frac{38+21}{2} = \frac{59}{2} = 29.5$ ft/sec

Exercise 4. (5 pts.) On the axes below, sketch the graph of the function $f(x) = \begin{cases} (x+2)^2 & \text{if } x < -2 \\ \frac{1}{2}x + 1 & \text{if } -2 \le x < 4 \\ |x-6| & \text{if } 4 \le x. \end{cases}$

Use the graph to determine the values of a for which $\lim_{x \to a} f(x)$ does not exist and, for each a-value, justify your answer.



a-value	justification
$a = 4$	The left and right-hand limits are different.