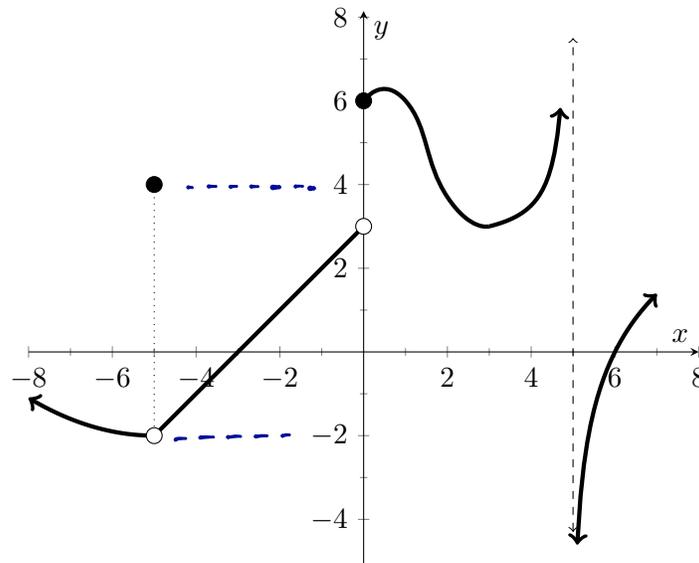


Name: _____ **Solutions**

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

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.

$$\lim_{x \rightarrow 3^-} \frac{5 - x^2}{3 - x} = \boxed{-\infty}$$

As x approaches 3 from below, $3 - x$ approaches zero but is positive. The numerator approaches $5 - 3^2 = -4$, a negative 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 [3, 4].

$$\text{average velocity} = \frac{\Delta s}{\Delta t} = \frac{119 - 70}{4 - 3} = \frac{49}{1} = 49 \text{ ft/sec}$$

(b.) Find the average velocity of the car over the time interval [4, 5].

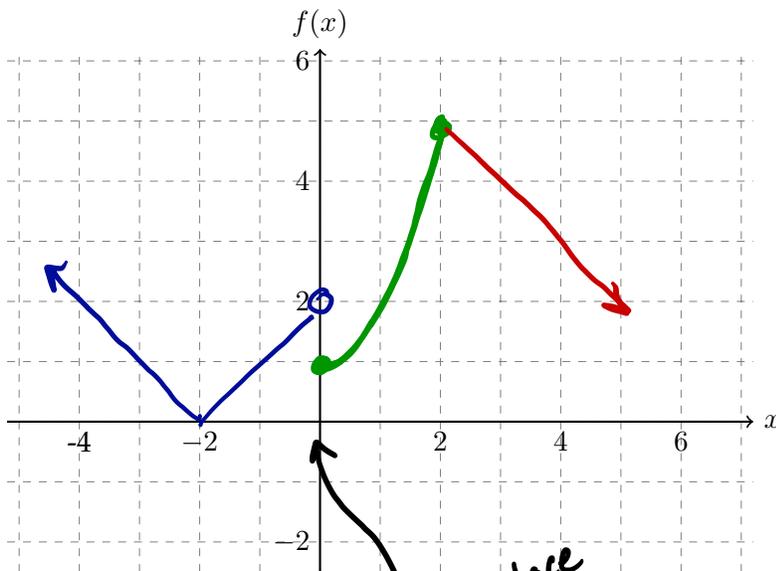
$$\text{average velocity} = \frac{\Delta s}{\Delta t} = \frac{179 - 119}{5 - 4} = \frac{60}{1} = 60 \text{ ft/sec}$$

(c.) Give a rough estimate of the instantaneous velocity at $t = 4$.

$$\text{average the velocity on either side} : \text{instantaneous velocity at } t=4 \approx \frac{60 + 49}{2} = \frac{109}{2} = 54.5 \text{ ft/sec}$$

Exercise 4. (5 pts.) On the axes below, sketch the graph of the function $f(x) = \begin{cases} |x + 2| & \text{if } x < 0 \\ x^2 + 1 & \text{if } 0 \leq x \leq 2 \\ 7 - x & \text{if } 2 < x. \end{cases}$

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



a-value	justification
$a = 0$	The left- and right-handed limits have different values.