

**Instructions:** Please work the following problems on other pieces of paper. You must show all work and calculations in order to receive full credit. I would prefer to collect your assignments in class on the day it is due, but I will accept it as late as 5:00 PM on the due date. Assignments submitted later will receive 50% credit. (Note: There are problems on the back, so don't forget to flip the page over.)

1. Suppose  $f(x) = \frac{x+3}{x^2-9}$ . Complete the following table (on a separate sheet of paper) to determine  $\lim_{x \rightarrow 3^-} f(x)$  and  $\lim_{x \rightarrow 3^+} f(x)$ . Does  $\lim_{x \rightarrow 3} f(x)$  exist? Does the graph of  $f$  have a hole or a vertical asymptote at  $x = 3$ ?

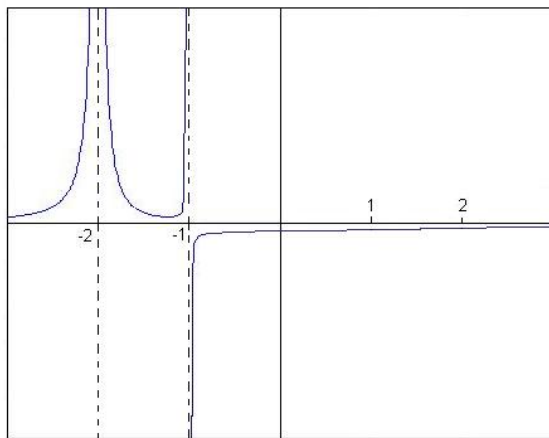
$x$	2.5	2.9	2.99	2.999	3.001	3.01	3.1	3.5
$f(x)$								

2. Let  $f(x) = \frac{8x^2 - 8x - 96}{5x^2 - 10x - 75}$ . Algebraically find  $\lim_{x \rightarrow -3} f(x)$ .
3. Section 2.2 # 30. You do not need to verify your result numerically.
4. Section 2.2 # 44.
5. Section 2.2 # 54.

6. Suppose  $f(x) = \frac{5x}{\sqrt{4x^2+1}}$ . Complete the following table (on a separate sheet of paper) to numerically estimate  $\lim_{x \rightarrow -\infty} f(x)$  and  $\lim_{x \rightarrow \infty} f(x)$ . Identify any horizontal asymptotes of  $f(x)$ .

$x$	-10000	-1000	-100	-10	10	100	1000	10000
$f(x)$								

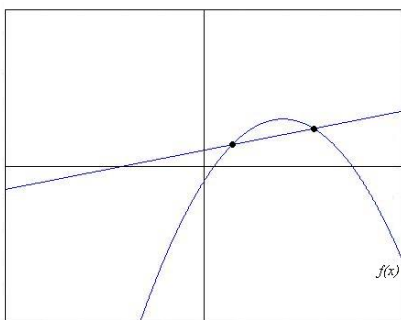
7. The graph of a function  $f(x)$  is shown below. Use the graph to evaluate the following:



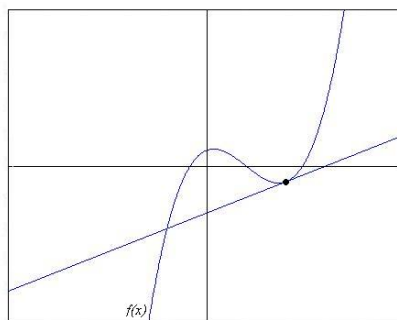
- a.)  $\lim_{x \rightarrow -2^-} f(x)$ .
- b.)  $\lim_{x \rightarrow -2^+} f(x)$ .
- c.)  $\lim_{x \rightarrow -2} f(x)$ .
- d.)  $\lim_{x \rightarrow -1^-} f(x)$ .
- e.)  $\lim_{x \rightarrow -1^+} f(x)$ .
- f.)  $\lim_{x \rightarrow -1} f(x)$ .
- g.)  $\lim_{x \rightarrow \infty} f(x)$ .

8. Classify each of the following graphs as exhibiting an average rate of change or an instantaneous rate of change.

a.)



b.)



9. Section 2.3 # 28.

10. (a) Section 2.4 # 6.

(b) Find the equation of the line tangent to  $f(x) = -2x^2 + x$  at  $x = 4$ . Write your answer in slope-intercept form. *Hint:* Use part (a).

(c) Sketch the graph of  $y = -2x^2 + x$  and the line you found in part (b) on the same axis.

11. Section 2.4 # 22.

12. Use the definition of the derivative to compute  $f'(x)$  if  $f(x) = \frac{1}{x}$ .

13. Section 2.4 # 48.