Name: _____ Date: _____ Row: _____ Period: _____ Assignment #: _____

****SHOW ALL NECESSARY WORK ON A SEPARATE SHEET OF PAPER****

1) Let P be the point $(3, 10)$ on the graph of $y = f(x)$. Each point Q in the table below is also on the graph of f. Find the slopes of each secant line PQ.

Q	Slope of PQ
(6, 18)	
(5, 15)	
(4, 12.3)	
(3.5, 11.1)	
(3.1, 10.21)	

2) What is your guess for the slope of the tangent line to $y = f(x)$ at $x = 3$ in question 1?

3) Let $P(1, 5)$ be a point on the graph of $f(x) = 6x - x^2$. Let $Q(x, f(x))$ be on the graph. Find the slope of the secant line PQ for each given x value for Q.

x	$f(x)$	Slope of PQ
3		
2		
1.5		
1.01		

4) Use your answer to question 3 to guess the slope of the tangent to $f(x)$ at P.

5) What is the equation of the tangent line to $f(x)$ at P in question 3?

6) Let $f(x) = x^2 + 3x$ be the distance in feet a race car has traveled from its starting point after x seconds.

a) How far has the race car traveled after 2 seconds? After 4 seconds?

b) what is the average velocity over the time interval $x = 2$ to $x = 4$?

c) what is the instantaneous velocity when $x = 2$?

7) Let $f(x) = mx + b$, a linear position function. Sometimes, Always, or Never:

The average velocity for $f(x)$ from P to Q is the same as the instantaneous velocity at P.

8) The distance that a runner is from the starting line is given in this table:

t (seconds)	0	1	2	3	4
d (meters)	0	4	9	16	24

a) Find the average velocity over the time intervals $[1, 4]$, $[1, 3]$, $[1, 2]$, and $[0, 1]$.

b) Estimate the instantaneous velocity at $t = 1$.

1) Find each:

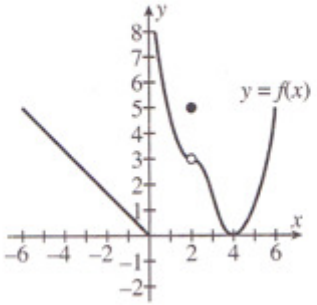
a) $\lim_{x \to 2} x + 8 =$ _____.

b) $\lim_{x \to 4} 2x + 6 =$ _____.

c) As $x \to 2$, $x^3 \to$ _____.

d) $\lim_{x \to 3} 7 =$ _____.

2) Answer each using the graph below:



a) $\lim_{x \to -5} f(x) =$

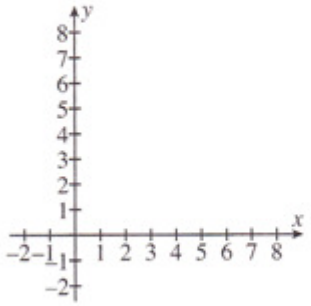
b) $\lim_{x \to 2} f(x) =$

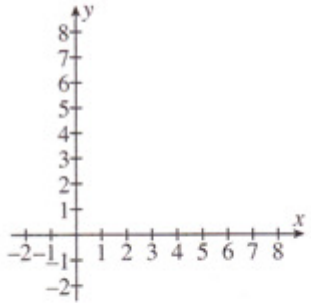
c) $\lim_{x \to 0} f(x) =$

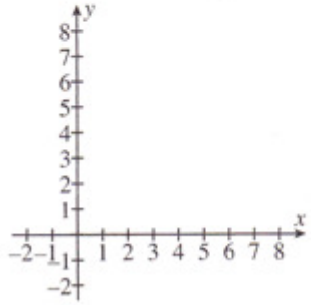
d) $\lim_{x \to 4} f(x) =$

3) Find $\lim_{x \to 2} |x - 5|$ by making a table of values for x near 2.

4) Sketch three different functions, each of which has $\lim_{x \to 4} f(x) = 2$.

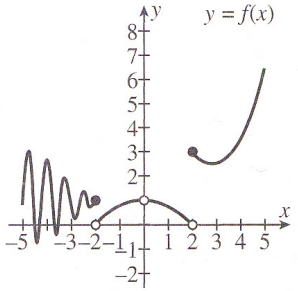






5) Estimate $\lim_{x \to 1} \frac{1}{1 - x}$.

6) Answer each using the graph of $y = f(x)$ below:



a) $\lim_{x \to -2^-} f(x) =$ _____.

b) $\lim_{x \to -2^+} f(x) =$ _____.

c) $\lim_{x \to -2} f(x) =$ _____.

d) $\lim_{x \to 2^+} f(x) =$ _____.

e) $\lim_{x \to 2^-} f(x) =$ _____.

f) $\lim_{x \to 2} f(x) =$ _____.

g) $\lim_{x \to 0^-} f(x) =$ _____.

h) $\lim_{x \to 0^+} f(x) =$ _____.

i) $\lim_{x \to 0} f(x) =$ _____.

7) $\lim_{x \to 3^-} \frac{3 - x}{|x - 3|} =$ _____.

8) Find $\lim_{x \to 2} f(x)$, where

$$f(x) = \begin{cases} 3x + 1 & \text{if } x < 2 \\ 8 & \text{if } x = 2 \\ x^2 + 3 & \text{if } x > 2 \end{cases}$$

9) Sometimes, Always, or Never:

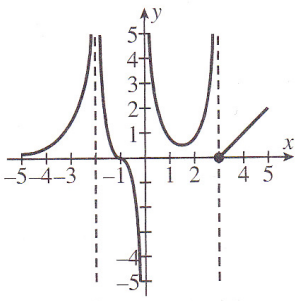
If $\lim_{x \to 2} f(x)$ does not exist, then $\lim_{x \to 2^+} f(x)$ does not exist.

10) Sometimes, Always, or Never:

If $\lim_{x \to 2^+} f(x)$ does not exist, then $\lim_{x \to 2} f(x)$ does not exist.

11) The spherical helium balloons sold at the Four Ring Circus are known to burst when inflated to diameters of 80 cm or greater. Describe the volume of a balloon, V, as a function of the diameter (x) and find $\lim_{x \to 80^-} V(x)$.

12) Evaluate the limits given the graph of $y = f(x)$ below:



a) $\lim_{x \to -2^+} f(x) =$ _____.

b) $\lim_{x \to -2^-} f(x) =$ _____.

c) $\lim_{x \to -2} f(x) =$ _____.

d) $\lim_{x \to 3^-} f(x) =$ _____.

e) $\lim_{x \to 3^+} f(x) =$ _____.

f) $\lim_{x \to 3} f(x) =$ _____.

g) $\lim_{x \to 0^+} f(x) =$ _____.

h) $\lim_{x \to 0^-} f(x) =$ _____.

i) $\lim_{x \to 0} f(x) =$ _____.

13) $\lim_{x \to 3} \frac{1}{|x - 3|} =$ _____.

14) $\lim_{x \to 0^+} \csc x =$ _____.

15) True or False: If $\lim_{x \to a} f(x) = \infty$ and $\lim_{x \to a} g(x) = \infty$, then $\lim_{x \to a} (f(x) - g(x)) = 0$.

16) Find $\lim_{x \to 3} \frac{x}{3 - x}$

17) What are the vertical asymptotes for the function in question 12?

18) Find the vertical asymptotes of $f(x) = \frac{x}{|x| - 1}$ and sketch the graph.