AP Calculus AB

Test Review Limits

<u>Instructions</u>: Be sure to follow the directions for each section. SHOW WORK! Good luck and have fun-ctions! Calculators *are* permitted on this test.

(6 points) 1. List the three requirements for a function to be continuous at x=c and give a graphical example of a function *failing* to be continuous for each reason.

2. (1 point each) Using the graph, evaluate each. (Scale is by 1's)



a. $\lim_{x\to 3} g(x)$	b. $\lim_{x \to 1} g(x)$
c. $\lim_{x\to 0} g(x)$	d. $\lim_{x\to -2^-} g(x)$
e. $\lim_{x\to -3} g(x)$	f. $\lim_{x \to 4} g(x)$
g. $\lim_{x\to 1^+} g(x)$	h. $\lim_{x\to 2} g(x)$
i. $\lim_{x \to 1^-} g(x)$	j. $\lim_{x \to -2^+} g(x)$
k. <i>f</i> (−3)	I. <i>f</i> (−2)
m. <i>f</i> (0)	n. <i>f</i> (1)
o. <i>f</i> (3)	p. <i>f</i> (4)

- 3. (5 points) Sketch an example of a *function* with the given attributes.
 - f(1)=7
 - f(-2)=6
 - The limit as x approaches -2 of f(x) does not exist; however, both one-sided limits exist.
 - The limit as x approaches 1 of f(x) is equal to 8.
 - The function is decreasing on (1,∞)

4. (6 points) Consider the following function:

$$f(x) = \begin{cases} a + bx, & \text{if } x > 2\\ 3, & \text{if } x = 2\\ b - ax^2, & \text{if } x < 2 \end{cases}$$

Determine the values of constants *a* and *b* so that $\lim_{x\to 2} f(x)$ exists and is equal to f(2).

5. (8 points) Find the *equation* of the tangent line to $f(x) = 14 - 3x^2$ at *x*=-2. Show all calculations and include a graph. Use the following equation: $m_{tan} = \frac{f(x_0+h)-f(x_0)}{h}$

6. (4 points) Let $f(x) = x^2 + 2x$. What is the average rate of change of f(x) on the interval [1,3]?

7. (2 points) If the limit as x approaches 2 is 4, what does that tell you about f(2)? Explain.

8. (2 points) If f(2) = 4, what does that tell you about the limit of f(x) as x approaches 2? Explain.

9. (2 points) Write, in words, how to say this: $\lim_{x\to 3} f(x) = 4$

10. (12 points) Sketch the graph of $f(x) = \begin{cases} 2x, & x < 2 \\ x^2, & x \ge 2 \end{cases}$ and identify each limit. (Be sure to include a scale)

a. $\lim_{x\to 2^-} f(x)$	b. $\lim_{x\to 2^+} f(x)$
c. $\lim_{x\to 2} f(x)$	d. $\lim_{x \to 1} f(x)$

11. (8 points) If an object travels a distance of $s = 2t^2 - 5t + 1$, where s is in feet and t is in seconds, find (a) the average velocity of the object within the first 10 seconds. Show all calculations and include proper units.

(b) the instantaneous velocity of the object at 3 seconds. Show all calculations and include proper units.