AP Calculus AB **Chapter 1 Review 2010** **Name _____**

Show all work! (Due day of test) **Team #_____ Period _____**

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No Calculator unless otherwise stated!

1. Find the limit and state the graphical significance.

a. $\lim_{x\to 4}\frac{2-\sqrt{x}}{4-x}$

b. $\lim_{x\to \frac{3\pi}{2}}\frac{\cos x}{\cot x}$

c. $\lim_{x\to 4}\frac{\frac{1}{x-2}-\frac{1}{2}}{x-4}$

d. $\lim_{x\to 2}\frac{-5}{(x-2)^4}$

e. $\lim_{x\to 3}\sqrt{3-x}$

f. $\lim_{x\to \infty}\frac{2x^2}{\sqrt{9x^4-3}}$

g. $\lim_{x\to 0}\frac{\sin 3x}{8x}$

h. $\lim_{x\to 1} f(x)$

$$f(x)=\begin{cases} x^2+1, & x>1 \\ 4, & x=1 \\ 3x-1, & x<1 \end{cases}$$

i. $\lim_{x\to -\infty}\frac{-2x}{\sqrt{9x^2+3}}$

j. $\lim_{x\to 3}\frac{|x-3|}{x-3}$

k. Given the table of values of $f(x)$, find $\lim_{x\to 3} f(x)$.

x	$f(x)$
2.997	-499.5
2.998	-749.5
2.999	-1499.5
3	------
3.001	1500.5
3.002	750.5
3.003	500.5

l. $\lim_{x\to -\infty} 2^{1/x}$

2. *Given the following information about f(x), draw a possible graph* ***AND*** *write the equation of this function.*

a. $\lim_{x\to 2} f(x)$ *DNE and* $f(2)$ *DNE*

b. $\lim_{x\to 2} f(x)$ *and* $f(2)$ *exist, but* $\lim_{x\to 2} f(x) \neq f(2)$

c. $\lim_{x\to -\infty} f(x) = 2$, $\lim_{x\to 3} f(x) \to -\infty$,
$f(x)$ is an even function.

3. *Use the* ***Formal Definition of Continuity*** *to determine if the function is continuous at the given point. If not, state what part of the definition failed and if the discontinuity is removable or non-removable.*

a. $f(x) = \left[\frac{x}{2}\right]$ at $x = 4$

b. $h(x) = \frac{x^2 + 2x - 15}{x - 3}$ at $x = 3$

4. $f(x) = x^3 - 3x^2 - 4x + 12$ *and* $h(x) = \begin{cases} \frac{f(x)}{x-3}, & x \neq 3 \\ K, & x=3 \end{cases}$

a. Find the zeros of f.

b. Find the value of K that makes $h(x)$ continuous at $x = 3$.

5. Use the ***Formal Definition of Continuity*** to find m if $f(x)$ is continuous at $x = 2$.

$$f(x) = \begin{cases} \sqrt{m-x}, & x < 2 \\ m-4, & x = 2 \\ x^2 - m + 4, & x > 2 \end{cases}$$

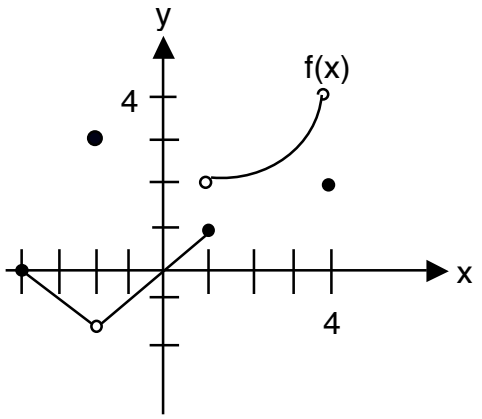
6. *Use your calculator to find these limits.* ***Show a part of the table to justify your work.***

a. $\lim\limits_{x \to 0^+} \dfrac{\sqrt{x}}{\sqrt{4+x}-2}$

b. $\lim\limits_{x \to 0} \left(\dfrac{\sec x - 1}{x^2} \right)$

c. $\lim\limits_{x \to 0} x \sin\left(\dfrac{1}{x}\right)$

7. *Using the graph of f(x), find the following:* *(Remember to state graphical significance for two-sided limits!)*



a. Domain $f =$
b. Range $f =$
c. $f(-2) =$
d. $\lim\limits_{x \to -4} f(x)$
e. $\lim\limits_{x \to 1^-} f(x)$
f. $\lim\limits_{x \to 4^+} f(x)$
g. $\lim\limits_{x \to -2} f(x)$
h. $\lim\limits_{x \to 1^+} f(x)$

8. *Verify that the Intermediate Value Theorem applies to the closed interval* $[-1,3]$ *and then find the value of* ***c*** *in the interval* $[-1,3]$.

$f(x) = 3x^2 - 13x - 4$, $[-1,3]$, $f(c) = 6$

9. Given $f(x) = x^3 - 3x^2 + 2$ and $f'(x) = 3x^2 - 6x$:

a. Find $f(-1)$ and $f'(-1)$.

b. If $h(x) = \dfrac{f(x)}{f'(x)}$, identify the x values for the points of discontinuity and label them as removable or non-removable.

c. Given $f'(-1)$ is the slope of the line that passes through the point $(-1, f(-1))$, write the equation of the line indicated.

d. Find $\lim\limits_{x\to\infty} \dfrac{f'(x)}{f(x)}$ and its graphical significance.

e. Find the extreme values for $f(x)$ in the interval $[0,4]$. (A calculator may be used.)

ANSWERS

1. a. $\frac{1}{4}$, hole $\left(4, \frac{1}{4}\right)$
   b. -1, hole at $\left(\frac{3\pi}{2}, -1\right)$
   c. $-\frac{1}{4}$, hole $\left(4, -\frac{1}{4}\right)$
   d. DNE *app* $-\infty$ *even* VA at x = 2
   e. DNE, endpoint at (3, 0)
   f. $\frac{2}{3}$, HA y = $\frac{2}{3}$
   g. $\frac{3}{8}$, hole $\left(0, \frac{3}{8}\right)$
   h. 2, hole at (1, 2)
   i. $\frac{2}{3}$, HA y = $\frac{2}{3}$
   j. DNE, [illegible]
   k. DNE, odd VA at x = 3
   l. 1, HA y =1

2. Answers vary – include graph and equation

3. a. No, $\lim\limits_{x\to 4} f(x)$ DNE, rt $\neq$ left
   b. No, f(3) DNE

4. a. 2, -2, 3
   b. 5

5. m = 6

6. a. DNE approaches $+\infty$
   b. .5, hole at $x = 0$
   c. 0, hole at (0, 0)

7. a. D: $[-4, 4]$
   b. R: $(-1.6, 1] \cup [2, 4)$
   c. 3
   d. DNE endpoint (-4, 0)
   e. 1
   f. DNE
   g. -1.6, hole at $\approx (-2, -1.6)$
   h. 2

8. c = $-\frac{2}{3}$

9. a. -2, 9
   b. x=0, x=2, both nonremovable (VA)
   c. $y + 2 = 9(x + 1)$ or $y = 9x + 7$
   d. 0, HA at y=0
   e. min: -2; max: 18