Name: _____

AP Calculus AB – Unit 1 Test Review

Review Topics
- Chapter 1
  - Linear equations
    - Slope $m = \frac{y_1 - y_2}{x_1 - x_2}$
    - Slope-intercept form $(y = mx + b)$
    - Point-slope form $(y = m(x - x_1) + y_1)$
    - Horizontal and vertical lines
    - Parallel and perpendicular lines

- Chapter 2
  - Limits
    - Be able to properly use limit notation
    - Limits from graphs, from tables, and algebraically
    - Properties of limits
    - Left and right hand limits
    - Solve limits involving $\lim\limits_{x \to 0} \dfrac{\sin x}{x}$
    - Limits involving infinity
    - Vertical asymptotes and behavior near them
    - Horizontal asymptotes
  - Continuity
  - Intermediate Value Theorem

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## NO CALCULATOR ALLOWED

1. Write the equation of the line described.  (continues to next page)

   a.  *y*-intercept: ½ ,          slope: -3

   b.  through (-3, 4) with a slope of -2

   c.  through (-1, 3) and (2, -6)

   d.  vertical line through (-2, 5)

e. line perpendicular to $y = \frac{4}{5}x - 8$ through (-4, 1)

2. Find the value of $x$ if the slope of the line through (-8, -2) and ($x$, 2) is 2. <u>Show your work</u>.

3. What are the three conditions that need to be met for a function $f(x)$ to be continuous at $x = c$?

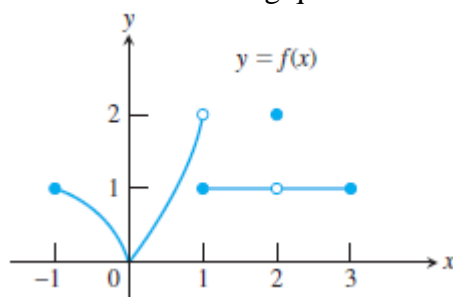4. Briefly describe what a limit of a function is.

5. Evaluate the following if $\lim\limits_{x \to 2} f(x) = 3$. <u>Show your work</u>.

    a. $\lim\limits_{x \to 2} (5f(x))$

    b. $\lim\limits_{x \to 2} (x \cdot f(x))$

    c. $\lim\limits_{x \to 2} (f(x))^2$

6. Use the graph below to answer the following questions.



a. $\lim_{x \to 1^-} f(x) =$

b. $\lim_{x \to 1^+} f(x) =$

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

d. $f(1) =$

e. Is $f(x)$ continuous at $x = 1$? Why or why not?

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

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

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

i. $f(2) =$

j. Is $f(x)$ continuous at $x = 2$? Why or why not?

k. Is $f(x)$ continuous at $x = 0$? Why or why not?

7. Use the graph of $f(x)$ to answer the following questions.

a. List all locations where $f(x)$ has an infinite discontinuity.

b. List all locations where $f(x)$ has a jump discontinuity.



c. List all locations where $f(x)$ has a removable discontinuity.
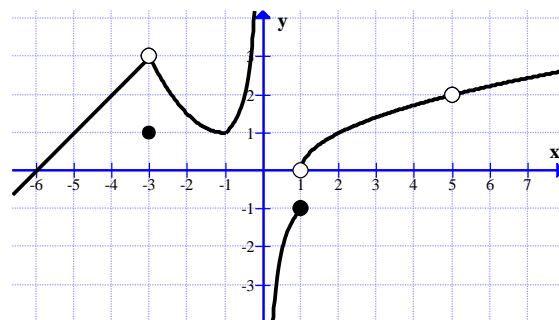
8. Evaluate the following limits.  <u>Show your work</u>.

a. $\lim\limits_{x\to 2} \dfrac{x-2}{x+2}$

d. $\lim\limits_{x\to 3} \dfrac{x-3}{x^2-9}$

b. $\lim\limits_{x\to 0} \dfrac{(3+x)^2 - 9}{x}$

e. $\lim\limits_{x\to 0} \dfrac{\sin(4x)}{x}$

c. $\lim\limits_{x\to 0} \dfrac{\dfrac{1}{x+3} - \dfrac{1}{3}}{x}$

f. $\lim\limits_{x\to 0} \dfrac{\sin(2x)}{2x^2 - 6x}$

**Show your "thinking"**

g. $\displaystyle\lim_{x\to-3^+} \frac{1}{x+3}$

h. $\displaystyle\lim_{x\to-4^-} \frac{x}{x+4}$

i. $\displaystyle\lim_{x\to-\infty} \frac{2x^2-5x+1}{3x^3-4}$

j. $\displaystyle\lim_{x\to-\infty} \frac{2x^2-5x+1}{3x^2-4}$

k. $\displaystyle\lim_{x\to-\infty} \frac{2x^4-5x+1}{3x^3-4}$

l. $\displaystyle\lim_{x\to\infty} \frac{\sqrt{x^2-5}}{x+7}$

m. $\displaystyle\lim_{x\to-\infty} \frac{\sqrt{x^2-5}}{x+7}$

9. Find the vertical asymptote(s) of $f(x) = \dfrac{-3}{x+4}$ and the behavior to the left and right of each asymptote.  <u>You must show your work</u>.

10. Find the horizontal asymptote(s) of $f(x) = \dfrac{2x^3 + 3x - 1}{4x^3 - 6}$. <u>You must show your work</u>.

11. Find the horizontal asymptote(s) of $f(x) = \dfrac{|x+4|}{x-3}$. <u>You must show your work</u>.

12. For a continuous function $f$, $f(0) = 7$ and $f(4) = 2$. Explain why $f(c) = 3$ for some $c$ $c$ in [0, 4] or explain why you don't have enough information to conclude this.