

AP Calculus AB

Limits - Review I

1) $\lim_{x \rightarrow 2} -x^2 + 4x$

- a) 0
- b) 12
- c) 4
- d) -12
- e) None of these

2) $\lim_{x \rightarrow 3} \frac{\sqrt{5x+10}}{x-3}$

- a) indeterminate
- b) 25
- c) does not exist
- d) 1
- e) None of these

3) $\lim_{x \rightarrow 0^-} 1 + \frac{1}{x}$

- a) 1
- b) $-\infty$ \therefore does not exist
- c) $+\infty$ \therefore does not exist
- d) -1
- e) None of these

4) $\lim_{x \rightarrow 1} \sin \pi x$

5) $\lim_{x \rightarrow 0} \cos \frac{1}{x}$

6) True or False (with reason):

If f is undefined at $x = c$, then the limit of $f(x)$ as x approaches c does not exist.

7) True or False (with reason): If the $\lim_{x \rightarrow c} f(x) = L$ then $f(c) = L$.

8) $\lim_{x \rightarrow 2} f(x)$ when $f(x) = \begin{cases} x^2 - 3x + 6 & \text{when } x < 2 \\ -x^2 + 3x + 2 & \text{when } x \geq 2 \end{cases}$

9) Find a c such that $f(x)$ is continuous on the entire real line.

$$f(x) = \begin{cases} x^2 & \text{when } x \leq 4 \\ \frac{c}{x} & \text{when } x > 4 \end{cases}$$

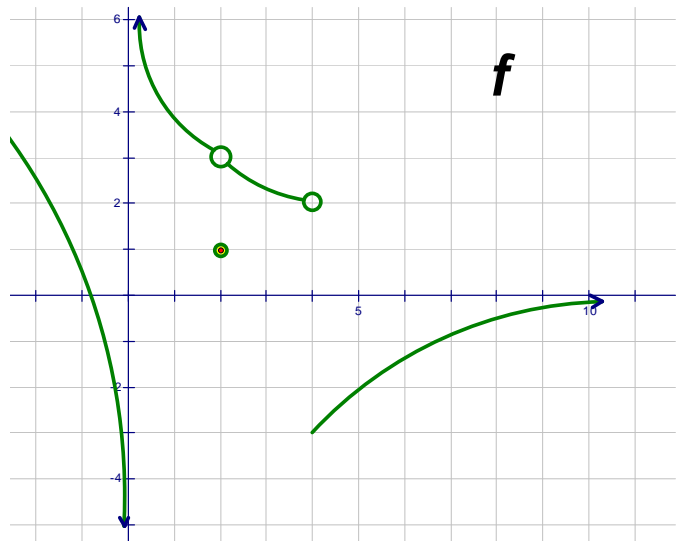
Use the graph at the right to answer questions 10 – 13.

10) $\lim_{x \rightarrow 2} f(x) =$

11) $\lim_{x \rightarrow 4^-} f(x) =$

12) $\lim_{x \rightarrow 4} f(x) =$

13) $\lim_{x \rightarrow 0} f(x) =$



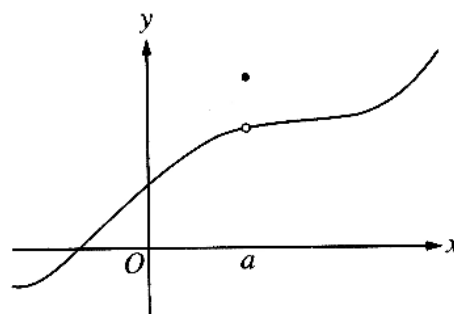
14) Find the x-values (if any) at which f is discontinuous. Label as removable or non-removable.

$$f(x) = \frac{2x + 6}{2x^2 - 18}$$

- a) x = 3 only....Non-removable
- b) x = - 3 only...Non-removable
- c) x = 3 and x = -3...Both non-removable
- d) x = -3...Removable, x = 3...Non-removable
- e) There are no discontinuities

15) The graph of the function f is shown to the right.
Which of the following statements is **false**?

- a) x = a is in the domain of f.
- b) $\lim_{x \rightarrow a^+} f(x)$ is equal to $\lim_{x \rightarrow a^-} f(x)$
- c) $\lim_{x \rightarrow a} f(x)$ exists
- d) $\lim_{x \rightarrow a}$ is not equal to f(a)
- e) f is continuous at x = a



16) Mrs. Evans drops her calculus book off of the top of a 220-foot building. The position function of the book is: $s(t) = -16t^2 + 220$. Using the velocity function below, find the velocity of the book when $t = 2$ seconds.

Velocity function: $\lim_{t \rightarrow a} \frac{s(a) - s(t)}{a - t}$

17) Approximate the limit **numerically** by completing the table:

$$\lim_{x \rightarrow 2} \frac{x^2}{x-2} = \underline{\hspace{2cm}}$$

x	1.9	1.99	1.999	2	2.001	2.01	2.1
f(x)							

Find the limit (show your work):

$$18) \lim_{x \rightarrow -4} \frac{x^2 + x - 12}{x + 4}$$

$$21) \lim_{x \rightarrow 0} \frac{\frac{1}{x+3} - \frac{1}{3}}{x}$$

$$19) \lim_{x \rightarrow 3} \frac{\sqrt{x+1} - 2}{x - 3}$$

$$22) \lim_{\Delta x \rightarrow 0} \frac{(x + \Delta x)^2 - 2(x + \Delta x) + 1 - (x^2 - 2x + 1)}{\Delta x}$$

$$20) \lim_{x \rightarrow 0} \frac{\sin x}{4x}$$

23) $\lim_{x \rightarrow 2^-} \frac{3+x}{2-x}$

- a) $+\infty$
- b) $-\infty$
- c) $+\infty$ therefore, does not exist
- d) $-\infty$ therefore, does not exist
- e) Indeterminate

24) For the Intermediate Value Theorem to GUARANTEE that $f(x)$ has a zero on the interval $[a, b]$, what conditions must exist?

25) On the graph below, draw a function that has the following properties:

- A step (or jump) discontinuity at $x = 5$
- $f(5) = 6$

