

Unit 1 Review

AP Calculus

1. Find $\lim_{x \rightarrow 2} (3x^2 + 5)$.
A. 41 B. 17 C. 11 D. 0
2. Find $\lim_{x \rightarrow 1} f(x)$ if $f(x) = \begin{cases} 3-x, & x \neq 1 \\ 1, & x = 1 \end{cases}$.
A. 2 B. 1 C. $\frac{3}{2}$ D. does not exist
3. Find $\lim_{x \rightarrow -1} \frac{x^2 + 3x + 2}{x^2 + 1}$.
A. 0 B. ∞ C. -1 D. does not exist
4. Find $\lim_{x \rightarrow 3} \sqrt{x^2 - 4}$.
A. 1 B. 5 C. -1 D. $\sqrt{5}$
5. If $\lim_{x \rightarrow c} f(x) = -\frac{1}{2}$ and $\lim_{x \rightarrow c} g(x) = \frac{2}{3}$, find $\lim_{x \rightarrow c} \frac{f(x)}{g(x)}$.
A. $-\frac{1}{3}$ B. $\frac{1}{3}$ C. $-\frac{3}{4}$ D. -3
6. Find $\lim_{x \rightarrow 2} \frac{x-2}{x^2-4}$.
A. 0 B. $\frac{1}{4}$ C. ∞ D. 1
7. Find $\lim_{x \rightarrow 0} \frac{\sqrt{x+4} - 2}{x}$.
A. 0 B. $\frac{1}{4}$ C. ∞ D. 1
8. Find $\lim_{x \rightarrow 3} \frac{x-3}{|x-3|}$.
A. 0 B. 1 C. 3 D. does not exist
9. Find $\lim_{x \rightarrow 3^+} \sqrt{2x-5}$.
A. 1 B. 0 C. 2 D. does not exist
10. Find $\lim_{x \rightarrow 2^-} \frac{1}{x-2}$.
A. ∞ B. $-\infty$ C. 0 D. $-\frac{1}{4}$

11. Find $\lim_{x \rightarrow 2} \frac{1}{(x-2)^2}$.
- A. ∞ B. $-\infty$ C. 0 D. $\frac{1}{4}$
12. Find $\lim_{x \rightarrow 0} \left(2 + \frac{5}{x^2} \right)$.
- A. 7 B. 2 C. ∞ D. 0
13. At which values of x is $f(x) = \frac{x^2 - 2x - 3}{x - 2}$ discontinuous?
- A. 2 B. -1, 2, 3 C. 1 D. $-1, \frac{3}{2}, 2, 3$
14. Let $f(x) = \frac{1}{x+1}$ and $g(x) = x^2 - 5$. Find all values of x for which $f(g(x))$ is discontinuous.
- A. -1 B. $-1, \pm\sqrt{5}$ C. $\pm\sqrt{5}$ D. -2, 2
15. Determine the value of c so that $f(x)$ is continuous for all real values of x when
- $$f(x) = \begin{cases} x-2, & x \leq 5 \\ cx-3, & x > 5 \end{cases}.$$
- A. 0 B. $\frac{6}{5}$ C. 1 D. $\frac{5}{6}$
16. Find all vertical asymptotes of $g(x) = \frac{2x+3}{2x^2+x-3}$.
- A. $x = -\frac{3}{2}, x = 3$ B. $x = -2$ C. $x = 3$ D. $x = 1$
17. Find $\lim_{x \rightarrow 0} \frac{1 - \cos^2 x}{x}$.
- A. 1 B. 0 C. ∞ D. does not exist
18. Find $\lim_{x \rightarrow \infty} \frac{2x^3 + 6x^2 + 5}{3 + x^3}$.
- A. $\frac{2}{3}$ B. ∞ C. 1 D. 2
19. Which of the following has a horizontal asymptote at $y = 2$?
- A. $\frac{x-2}{3x-5}$ B. $\frac{2x}{\sqrt{x-2}}$ C. $\frac{2x^2 - 6x + 1}{1 + x^2}$ D. $\frac{2x-1}{x^2+1}$
20. Find $\lim_{x \rightarrow \infty} \frac{\sqrt{4x^2 - 1}}{x^2}$.
- A. 4 B. 0 C. 2 D. ∞

28. Suppose $f(x) = \begin{cases} \frac{3x(x-1)}{x^2-3x+2}, & x \neq 1, 2 \\ -3, & x = 1 \\ 4, & x = 2 \end{cases}$. Then $f(x)$ is continuous:
- A. except at $x = 1$ B. except at $x = 2$ C. except at $x = 1$ or 2
D. except at $x = 0, 1$, or 2 E. at each real number
29. If the function f is continuous for all real numbers and $f(x) = \frac{x^2-4}{x+2}, x \neq -2$, then $f(-2) =$
- A. -2 B. -1 C. 0 D. 2 E. -4
30. Find the limit: $\lim_{\Delta x \rightarrow 0} \frac{(x+\Delta x)^2 - 2(x+\Delta x) - (x^2 - 2x)}{\Delta x}$

Answers

- | | | |
|-------|-------|--------------|
| 1) B | 11) A | 21) B |
| 2) A | 12) C | 22) A |
| 3) A | 13) A | 23) E |
| 4) D | 14) D | 24) C |
| 5) C | 15) B | 25) A |
| 6) B | 16) D | 26) B |
| 7) B | 17) B | 27) C |
| 8) D | 18) D | 28) B |
| 9) A | 19) C | 29) E |
| 10) B | 20) B | 30) $2x - 2$ |

Text Review

Pg 87/ 5-20, 23-29, 33, 36-42, 45, 46,
49-51, 57-65

Pg. 235/21-28

PRACTICE PROBLEMS

Now try these problems. The answers are in chapter 21.

1. Is the function $f(x) = \begin{cases} x+7, & x < 2 \\ 9, & x = 2 \\ 3x+3, & x > 2 \end{cases}$ continuous at $x = 2$?

2. Is the function $f(x) = \begin{cases} 4x^2 - 2x, & x < 3 \\ 10x - 1, & x = 3 \\ 30, & x > 3 \end{cases}$ continuous at $x = 3$?

3. Is the function $f(x) = \begin{cases} 5x+7, & x < 3 \\ 7x+1, & x > 3 \end{cases}$ continuous at $x = 3$?

~~4. Is the function $f(x) = \sec x$ continuous everywhere?~~

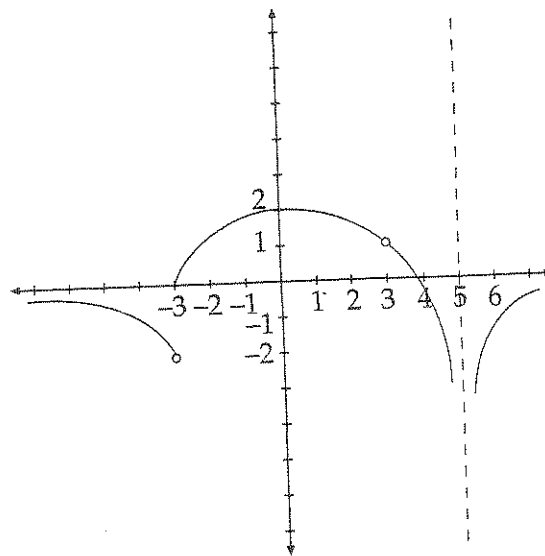
~~5. Is the function $f(x) = \sec x$ continuous on the interval $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$?~~

~~6. Is the function $f(x) = \sec x$ continuous on the interval $\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$?~~

7. For what value(s) of k is the function $f(x) = \begin{cases} 3x^2 - 11x - 4, & x \leq 4 \\ kx^2 - 2x - 1, & x > 4 \end{cases}$ continuous at $x = 4$?

8. For what value(s) of k is the function $f(x) = \begin{cases} -6x - 12, & x < -3 \\ k^2 - 5k, & x = -3 \\ 6, & x > -3 \end{cases}$ continuous at $x = -3$?

9. At what point is the removable discontinuity for the function $f(x) = \frac{x^2 + 5x - 24}{x^2 - x - 6}$?



10. Given the graph of $f(x)$ above, find:

- (a) $\lim_{x \rightarrow -\infty} f(x)$
- (b) $\lim_{x \rightarrow \infty} f(x)$
- (c) $\lim_{x \rightarrow 3^-} f(x)$
- (d) $\lim_{x \rightarrow 3^+} f(x)$
- (e) $f(3)$
- (f) Any other discontinuities.

KEY

- ① yes
- ② no
- ③ no
- ④ $k = 9/16$
- ⑤ $k = -1, 6$
- ⑥ $x = 3$
- ⑦ a) 0
- b) 0
- c) 1
- d) 1
- e) DNE
- f) $k = -3, 3, 5$