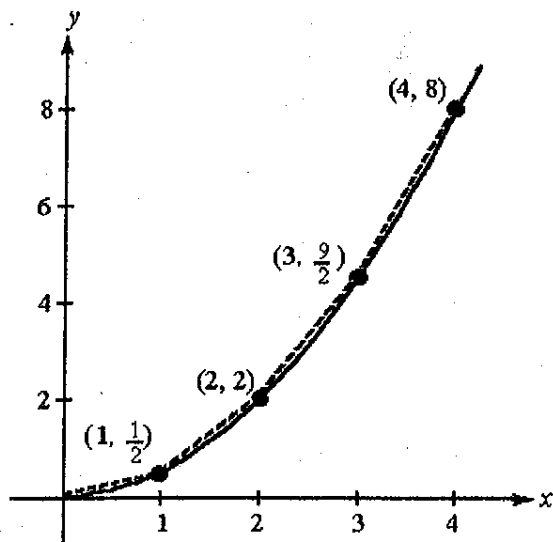CALCULUS – CHAPTER I REVIEW   NAME _____
Multiple Choice

1. Approximate the length of the curve by finding the sum of the lengths of the four line
   segments as shown in the figure. Round your answer to three decimal places.
   (a)   19.380
   (b)   7.629
   (c)   9.683
   (d)   9.294
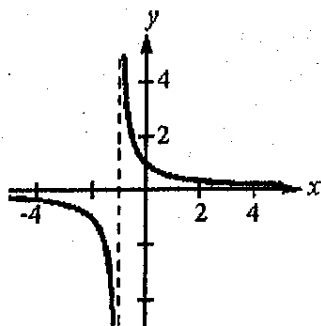   (e)   None of these

2. Use the rectangles to approximate the area of the region in the first quadrant bounded by the
   graphs of $y = x^2 + 1$, $y = 0$, $x = 1$, and $x = 2$.
   (a)   1.24
   (b)   3.64
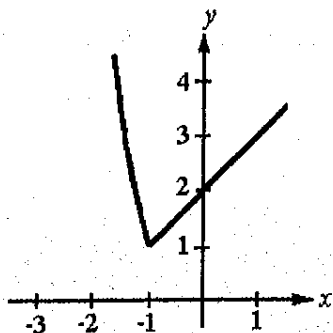   (c) $\dfrac{10}{3}$
   (d)   3.04
   (e)   None of these
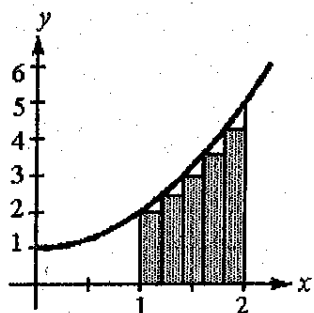
3. Use the graph of find $\lim\limits_{x \to -1} f(x)$ for $f(x) = \dfrac{1}{x + 1}$.

   (a) 0
   (b) 1
   (c) ∞
   (d) Does not exist
   (e) None of these

4. Use the graph to estimate $\lim\limits_{x \to -1} f(x)$.

   (a) 1
   (b) −1
   (c) 0
   (d) Limit does not exist
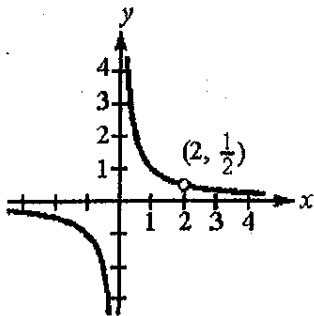   (e) None of these

5. Given $\lim\limits_{x \to 2} (2x - 1) = 3$. Find δ such that $|(2x - 1) - 3| < 0.01$ whenever $0 < |x - 2| < \delta$.

   (a) 3
   (b) 0.05
   (c) 0.03
   (d) 0.005
   (e) None of these

6. Use the graph to find $\lim\limits_{x \to 2} f(x)$ (if it exists) for $f(x) = \dfrac{x - 2}{x^2 - 2x}$.

    (a) The limit does not exist.
    (b) 2
    (c) $\dfrac{1}{2}$
    (d) 0
    (e) None of these

7. Find the limit: $\lim\limits_{x \to -3} (-2x^2 + 1)$.

    (a) 37
    (b) 19
    (c) -17
    (d) $\pm\sqrt{2}$
    (e) None of these

8. Find the limit: $\lim\limits_{x \to 3} \sqrt{x^2 - 4}$.

    (a) 1
    (b) 5
    (c) -1
    (d) $\sqrt{5}$
    (e) None of these

9. If $\lim\limits_{x \to c} f(x) = -6$ and $\lim\limits_{x \to c} g(x) = 3$, then find $\lim\limits_{x \to c} ([\,f(x)]^2 - 2f(x)\,g(x) + [\,g(x)]^2)$.

    (a) 63
    (b) 81
    (c) 45
    (d) -9
    (e) None of these

10. Find the limit: $\lim\limits_{x \to 2} \sec \dfrac{\pi x}{3}$.

   (a) -2

   (b) $\dfrac{2}{\sqrt{3}}$

   (c) $-\dfrac{\sqrt{3}}{2}$

   (d) $\dfrac{1}{2}$

   (e) None of these

11. Find the limit: $\lim\limits_{x \to -1} \dfrac{x^2 - 5x - 6}{x + 1}$.

   (a) 0
   (b) -7
   (c) $-\infty$
   (d) ∞
   (e) None of these

12. Find the limit: $\lim\limits_{x \to 3} \dfrac{x - 3}{|x - 3|}$.

   (a) 0
   (b) 1
   (c) 3
   (d) Does not exist
   (e) None of these

13. Find the limit: $\lim\limits_{x \to 0} \dfrac{\sqrt{x + 4} - 2}{x}$.

   (a) 0

   (b) $\dfrac{1}{4}$

   (c) ∞
   (d) 1
   (e) None of these

14. Find the limit: $\lim\limits_{x \to 0} \dfrac{\dfrac{1}{x + 3} - \dfrac{1}{3}}{x}$.

   (a) $-\dfrac{1}{9}$

   (b) 0

   (c) $\dfrac{1}{9}$

   (d) Limit does not exist
   (e) None of these

15. Find the limit: $\lim\limits_{x \to 6-} \dfrac{|3x - 18|}{6 - x}$.

  (a) -1
  (b) 1
  (c) 3
  (d) -3
  (e) None of these

16. At which value(s) of x is $f(x) = \dfrac{(x^2 - 2x - 3)}{x - 2}$ discontinuous?

  (a) 2
  (b) -1, 2, 3
  (c) 1
  (d) -1, $\frac{3}{2}$, 2, 3
  (e) None of these

17. Determine the value of c so that $f(x)$ is continuous on the entire real line 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) $\frac{5}{6}$
  (e) None of these

18. Which of the following statements is *not* true of $f(x) = \sqrt{x^2 - 36}$?
  (a) f is continuous on the interval $[6, \infty)$.
  (b) f is continuous on the interval $[-6, 6]$.
  (c) f is continuous on the interval $(-\infty, -6]$.
  (d) f is continuous at $x = 12$.
  (e) None of these

19. Find the x-values (if any) for which f is not continuous.

  $$f(x) = \begin{cases} \dfrac{1}{(x - 3)}, & x \leq 5 \\ \dfrac{1}{2}, & x > 5 \end{cases}$$

  (a) 5
  (b) $\frac{1}{2}$
  (c) 3
  (d) 3, 5
  (e) None of these

20. Find the limit: $\lim\limits_{x \to 0} \left[2 + \dfrac{5}{x^2} \right]$.

  (a) 7
  (b) 2
  (c) ∞
  (d) $-\infty$
  (e) None of these

21. Find the limit: $\lim\limits_{x \to 1} \left[2 - \dfrac{5}{(x-1)^2} \right]$.

    (a) $-\infty$
    (b) $+\infty$
    (c) -3
    (d) 2
    (e) None of these

22. Find all vertical asymptotes of the graph of $f(x) = \dfrac{x-3}{x+2}$.

    (a) $x = -2$, $x = 3$
    (b) $x = -2$
    (c) $x = 3$
    (d) $x = 1$
    (e) None of these

23. $f(x)$ decreases without bound as x approaches what value from the right?

    $$f(x) = \frac{7}{(x-1)(7-x)}$$

    (a) 1
    (b) -1
    (c) 7
    (d) -7
    (e) None of these

24. Find the limit: $\lim\limits_{x \to 3-} \dfrac{x^2 - 3x + 2}{x^2 - 5x + 6}$.

    (a) $\dfrac{1}{3}$
    (b) $+\infty$
    (c) $-\infty$
    (d) 1
    (e) None of these

25. Find the limit: $\lim\limits_{x \to 1-} \dfrac{-2}{x-1}$.

    (a) ∞
    (b) $-\infty$
    (c) 0
    (d) Limit does not exist
    (e) None of these

Short Answer

26.

Open-Ended Questions

27. Let $f(x) = \begin{cases} x, & x \le 0 \\ x^2, & x > 0 \end{cases}$. Sketch a graph of f and find the limit:
 $\lim\limits_{x \to 0} f(x)$.

28. Sketch the graph of a function $y = f(x)$ such that $\lim\limits_{x \to -1} f(x)$ does not exist.

29. Find the limit: $\lim\limits_{x \to -2} (x^2 + 4x - 3)$.

30. Find the limit: $\lim\limits_{x \to \pi} \dfrac{1 - \cos x}{x}$.

31. Use a graphing utility to graph the function $f(x) = x^2 - 2x + 1$ and then estimate $\lim\limits_{x \to 1} f(x)$.

32. Find the limit: $\lim\limits_{x \to 2} \dfrac{3x^3 - 4x^2 - 5x + 2}{x^2 - x - 2}$.

33. Find the limit: $\lim\limits_{\Delta x \to 0} \dfrac{\sqrt{x + \Delta x} - \sqrt{x}}{\Delta x}$.

34. Find the limit: $\lim\limits_{x \to 0} \dfrac{x}{\sin 3x}$.

35. Sketch the graph of $f(x) = \dfrac{x^2 - x - 2}{x + 1}$.

36. Use a graphing utility to find the limit: $\lim\limits_{x \to 0} \dfrac{\sin 4x}{x}$. Then verify your answer analytically.

37. Find the limit: $\lim\limits_{x \to 1+} \sqrt{x - 1}$.

38. Find the x-values (if any) at which $f(x) = \dfrac{x^2 - 6x + 5}{x - 6}$ is discontinuous. Are they removable or nonremovable?

39. Let $f(x) = \dfrac{5}{x - 1}$ and $g(x) = x^4$.

 a. Find $f(g(x))$.

 b. Find all values of x for which $f(g(x))$ is discontinuous.

40. Use the graph of f below to find the x-values (if any) at which f is not continuous.
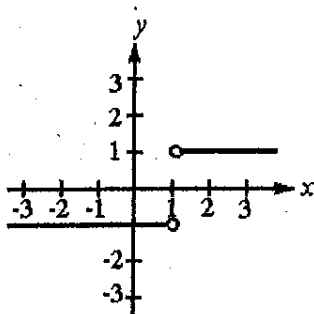
41. Use the Intermediate Value Theorem to show that the function $f(x) = x^4 - 2x^2 + 3x$ has a zero in the interval $[-2, -1]$.

42. Use a graphing utility to graph $f(x) = \dfrac{x + 2}{x^2 - 4}$. Then use the graph to determine x-values at which the function is not continuous.

43. Let $f(x) = \begin{cases} x^2 + 1, & x \leq 0 \\ 2x - 3, & x > 0 \end{cases}$. Find each limit (if it exists).

 a. $\lim\limits_{x \to 0^-} f(x)$

 b. $\lim\limits_{x \to 0^+} f(x)$

 c. $\lim\limits_{x \to 0} f(x)$

44. Find the limit: $\lim\limits_{x \to 3} \dfrac{3}{x^2 - 6x + 9}$.

45. Find all vertical asymptotes of the graph of $f(x) = \dfrac{2x - 2}{(x - 1)(x^2 + x - 1)}$.

46. Use a graphing utility to find the vertical asymptote(s) (if any) for $f(x) = \dfrac{\cot x}{x}$.