CALCULUS

MIDTERM REVIEW #2

1. Use the graph to find $\lim\limits_{x \to -1} f(x)$ if $f(x) = \dfrac{1}{x+1}$.

   (a)   0

   (b)   1

   (c) ∞

   (d)   Does not exist

   (e)   None of these

2. Find $\lim\limits_{x \to -1} \dfrac{x^2 + 2x + 3}{x^2 + 1}$.

   (a)   0   (b)   1   (c) ∞

   (d)   Does not exist   (e)   None of these

3. Find $\lim\limits_{x \to 3} \sqrt{9 - x^2}$.

   (a)   0   (b) $\sqrt{6}$ (c) $3\sqrt{2}$

   (d)   Does not exist   (e)   None of these

4. If $\lim\limits_{x \to c} f(x) = -\dfrac{1}{2}$ and $\lim\limits_{x \to c} g(x) = \dfrac{2}{3}$, find $\lim\limits_{x \to c} [f(x)g(x)]$.

   (a) $\dfrac{1}{6}$ (b) $-\dfrac{1}{3}$ (c)   1

   (d)   Does not exist   (e)   None of these

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

   (a)   0   (b) -7 (c) $-\infty$

   (d) ∞ (e)   None of these

6. Find an equation for the line passing through the point $(4, -1)$ and parallel to the line $2x - 3y = 3$.

   (a) $2x - 3y = 11$ (b) $2x - 3y = -5$ (c) $3x - 2y = -5$

   (d) $y = \dfrac{2}{3}x - 1$ (e)   None of these

7. Find the equation of the line passing through the point $(1, -4)$ and perpendicular to the line $x = 7$.

   (a) $y + 4 = 0$ (b) $x - 1 = 0$ (c) $y + 4 = x - 1$

   (d) $2x + 3y + 10 = 0$ (e)   None of these

8. Find the domain of $f(x) = \dfrac{1}{\sqrt{3 - 2x}}$.

   (a) $\left(-\infty, \dfrac{3}{2}\right)$

9. If $f(x) = 2x^2 + 4$, which of the following will calculate the derivative of $f(x)$?

(a) $\dfrac{[2(x + \Delta x)^2 + 4] - (2x^2 + 4)}{\Delta x}$

(b) $\lim\limits_{\Delta x \to 0} \dfrac{(2x^2 + 4 + \Delta x) - (2x^2 + 4)}{\Delta x}$

(c) $\lim\limits_{\Delta x \to 0} \dfrac{[2(x + \Delta x)^2 + 4] - (2x^2 + 4)}{\Delta x}$

(d) $\dfrac{(2x^2 + 4 + \Delta x) - (2x^2 + 4)}{\Delta x}$

(e) None of these

10 Differentiate: $y = \dfrac{1 + x^2}{1 - x^2}$.

(a) $\dfrac{-4x^3}{(1 + x^2)^2}$

(b) -1

(c) 0

(d) $\dfrac{4x}{(1 + x^2)^2}$

(e) None of these

11 Find dy/dx for $y = x^3 \sqrt{x + 1}$.

(a) $\dfrac{3x^2}{2\sqrt{x + 1}}$

(b) $\dfrac{x^2(7x + 6)}{2\sqrt{x + 1}}$

(c) $3x^2 \sqrt{x + 1}$

(d) $\dfrac{7x^3 + x^2}{2\sqrt{x + 1}}$

(e) None of these

12. Find $f'(x)$ for $f(x) = (2x^2 + 5)^7$.

(a) $7(4x)^6$

(b) $(4x)^7$

(c) $28x(2x^2 + 5)^6$

(d) $7(2x^2 + 5)^6$

(e) None of these

13 Find $\dfrac{d^2 y}{dx^2}$ for $y = \dfrac{x + 3}{x - 1}$.

(a) 0

(b) $\dfrac{-8}{(x - 1)^3}$

(c) $\dfrac{-4}{(x - 1)^3}$

(d) $\dfrac{8}{(x - 1)^3}$

(e) None of these

4 The position equation for the movement of a particle is given by $s = (t^2 - 1)^3$ when s is measured in feet and t is measured in seconds. Find the acceleration at two seconds.

(a) 342 units/sec^2

(b) 18 units/sec^2

(c) 288 units/sec^2

(d) 90 units/sec^2

(e) None of these

5 Find all extrema in the interval $[0, 3]$ if $y = 2x^2 + 8x$

(a) Maximum: $(2, 8)$; Minimum: $(0, 0)$

(b) Maximum: $(2, 8)$; Minimum: $(3, 6)$

(c) Maximum: $(3, 6)$; Minimum: $(2, 8)$

(d) Maximum: $(3, 6)$; Minimum: $(0, 0)$

16. Find y' if $y^2 - 3xy + x^2 = 7$.

(a) $\dfrac{2x + y}{3x - 2y}$

(b) $\dfrac{3y - 2x}{2y - 3x}$

(c) $\dfrac{2x}{3 - 2y}$

(d) $\dfrac{2x}{y}$

(e) None of these

17. Find $\dfrac{dy}{dx}$ if $y = \dfrac{1}{x + y}$.

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

(b) $\dfrac{3y}{x}$

(c) $\dfrac{-y}{x + 2y}$

(d) $\dfrac{-1}{x^2 + y^2}$

(e) None of these

18. Differentiate: $f(x) = \dfrac{3}{\sqrt[3]{x^2}}$.

(a) $\dfrac{2}{\sqrt[3]{x}}$

(b) $\dfrac{-2}{x^{5/3}}$

(c) 0

(d) $-2\sqrt[3]{x}$

(e) None of these

19. Find the derivative: $y = \dfrac{3x}{\sqrt{x + 1}}$.

(a) $\dfrac{3(x + 2)}{2(x + 1)^{3/2}}$

(b) $6\sqrt{x + 1}$

(c) $\dfrac{9x + 6}{2(x + 1)^{3/2}}$

(d) $\dfrac{-3x}{(x + 1)^{3/2}}$

(e) None of these

20. Find an equation for the tangent line to the graph of $f(x) = 2x^2 - 2x + 3$ at the point where $x = 1$.

(a) $y = 2x - 2$

(b) $y = 4x^2 - 6x + 5$

(c) $y = 2x + 1$

(d) $y = 4x^2 - 6x + 2$

(e) None of these

21. Find all points on the graph of $f(x) = -x^3 + 3x^2 - 2$ at which there is a horizontal tangent line.

(a) $(0, -2), (2, 2)$

(b) $(0, -2)$

(c) $(1, 0), (0, -2)$

(d) $(2, 2)$

(e) None of these

22. Find the instantaneous rate of change of w with respect to z if $w = \dfrac{7}{3z^2}$.

(a) $\dfrac{7}{6z}$

(b) $\dfrac{14}{3}z$

(c) $-\dfrac{14}{3z}$

(d) $-\dfrac{14}{3z^3}$

(e) None of these

23. Suppose the position equation for a moving object is given by $s(t) = 3t^2 + 2t + 5$ where s is measured in meters and t is measured in seconds. Find the velocity of the object when $t = 2$.
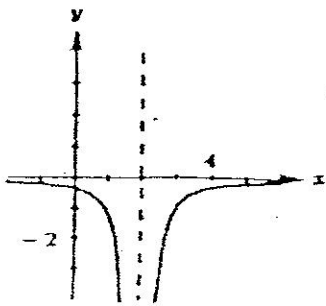
(a) 13 m/sec

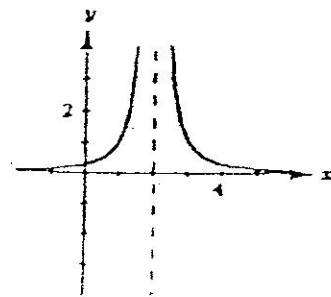(b) 14 m/sec

(c) 30 m/sec

(d) 6 m/sec

(e) None of these

24. Which of the following is the correct sketch of the graph of the function $f(x) = \dfrac{1}{(x-2)^2}$?
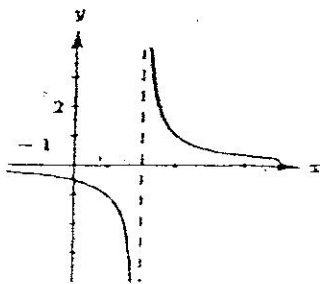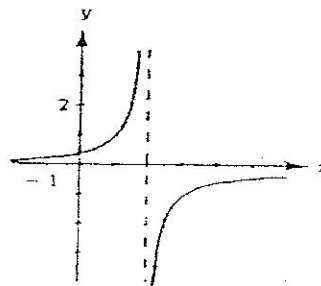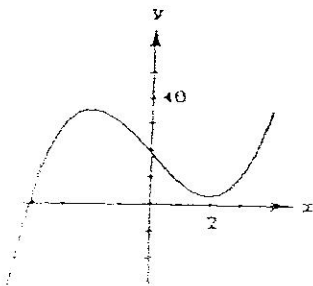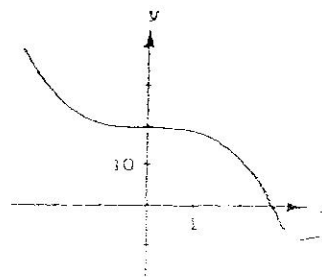
(a)

(b)

(c)

(d)

(e) None of these

25. Which of the following is the correct sketch of the graph of the function $y = x^3 - 12x + 20$?
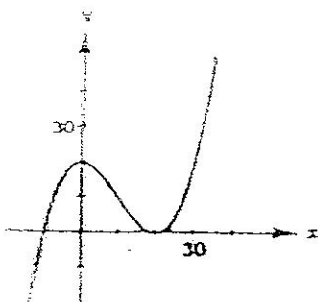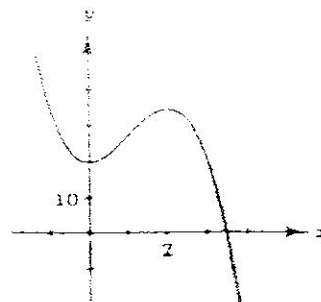
(a)

(b)

(c)

(d)

None of these

25. Find all intervals on which $f(x) = \dfrac{x}{x^2 + 4}$ is decreasing.

(a) $(0, \infty)$ (b) $(-2, 2)$ (c) $(-\infty, 0)$

(d) $(-\infty, \infty)$ (e) None of these

26. Find all critical numbers: $f(x) = \dfrac{x-1}{x+3}$.

(a) 1   (b) 1, -3 (c) -3

(d) 1, -1 (e) None of these

27. Find the values of x that give relative extrema for the function $f(x) = 3x^5 - 5x^3$.

(a) Relative maximum: $x = 0$; Relative minimum: $x = \sqrt{5/3}$

(b) Relative maximum: $x = -1$; Relative minimum: $x = 1$

(c) Relative maxima: $x = \pm 1$; Relative minimum: $x = 0$

(d) Relative maximum: $x = 0$; Relative minima: $x = \pm 1$

(e) None of these

28. Find all intervals on which the function is concave upward: $f(x) = \dfrac{x^2 + 1}{x^2}$.

(a) $(-\infty, \infty)$ (b) $(-\infty, -1)$ and $(1, \infty)$ (c) $(-\infty, 0)$ and $(0, \infty)$

(d) $(1, \infty)$ (e) None of these

30. Let $f''(x) = 4x^3 - 2x$ and let $f(x)$ have critical numbers -1, 0, and 1. Use the Second Derivative Test to determine if any of the critical numbers gives a relative maximum.

(a) -1 (b) 0   (c) 1

(d) -1 and 1   (e) None of these

31. Find $\displaystyle \lim_{x \to \infty} \dfrac{2x^3 + 6x^2 + 5}{3 + x^3}$.

(a) $\dfrac{2}{3}$ (b) ∞ (c) 1

(d) 2   (e) None of these

32. Which of the following functions has a horizontal asymptote at $y = 2$?

(a) $\dfrac{x-2}{3x-5}$ (b) $\dfrac{2x}{\sqrt{x-2}}$ (c) $\dfrac{2x^2 - 6x + 1}{1 + x^2}$

(d) $\dfrac{2x-1}{x^2 + 1}$ (e) None of these

33. Find all points of inflection: $f(x) = \dfrac{1}{12}x^4 - 2x^2 - 15$

(a) $(2, 0)$ (b) $(2, 0), (-2, 0)$ (c) $(0, 15)$

(d) $\left(2, \dfrac{25}{3}\right), \left(-2, \dfrac{25}{3}\right)$ (e) None of these

34. The management of a large store wishes to add a fenced-in rectangular storage yard of 20,000 sq.ft., using the building as one side of the yard. Find the minimum amount of fencing that must be used to enclose the remaining 3 sides of the yard.

35. At which values of x is $f(x) = \dfrac{x-4}{(x-2)(x+1)}$ discontinuous?

(a) 4

(b) -1, 2, 4

(c) -1, 2

(d) -1, 2, 4, -2

(e) None of these

36. Let $f(x) = \dfrac{1}{\sqrt{x}}$ and $g(x) = x - 1$. Find all values of x for which $f(g(x))$ is discontinuous.

(a) 0

(b) 1

(c) 0, 1

(d) -1, 1

(e) None of these

37. Determine the value of c so that $f(x)$ is continuous on the entire real line when
$$f(x) = \begin{cases} x + 3, & x \le -1 \\ 2x - c, & x > -1. \end{cases}$$

(a) -4

(b) 4

(c) 0

(d) -1

(e) None of these

38. Find all vertical asymptotes of $f(x) = \dfrac{2x - 1}{x + 3}$.

(a) $x = 2$

(b) $x = \dfrac{1}{2}$, $x = -3$

(c) $x = -3$

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

(e) None of these

39. Find all vertical asymptotes of $f(x) = \dfrac{x - 2}{x^2 - 4}$.

(a) $x = -2$, $x = 2$

(b) $x = -2$

(c) $x = 0$

(d) $x = 2$

(e) None of these

40. The cost of producing x units of a certain product is given by $C = 10,000 + 5x + \frac{1}{9}x^2$. Find the value of x that gives the minimum average cost.

(a) 30,000

(b) 300

(c) 3,000

(d) 30

(e) None of these

41. Find $\lim\limits_{x \to 0^+} \dfrac{1}{x}$

(a) ∞

(b) 0

(c) $-\infty$

(d) Does not exist

(e) None of these

42. Find $\lim\limits_{x \to 1} \dfrac{x}{(x - 1)^2}$

(a) 0

(b) $-\infty$

(c) $\dfrac{5}{4}$

(d) ∞

(e) None of these

43. Find $\lim\limits_{x \to 1} \left(2 - \dfrac{5}{(x - 1)^2} \right)$