

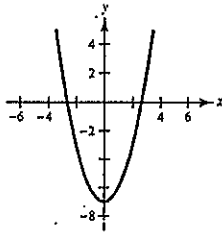
# CHAPTER P

## Preparation for Calculus

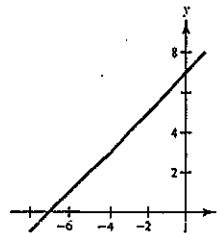
### P.1 Graphs and Models

1. Identify the graph of the equation:  $y = |x + 7|$ .

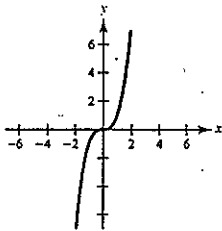
(a)



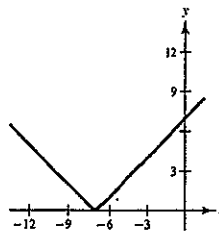
(b)



(c)



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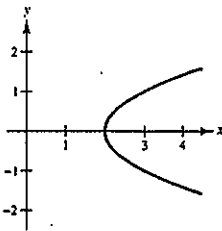


(e) None of these

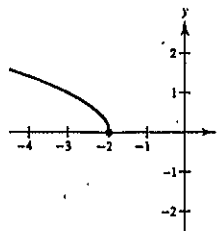
1—M—Answer:

2. Identify the graph of the equation:  $y = \sqrt{2 - x}$ .

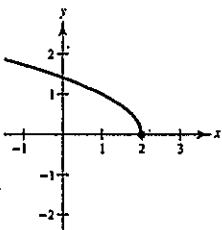
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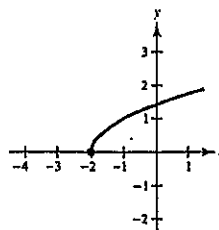
(b)



(c)



(d)



(e) None of these

1—M—Answer:

3. Find the  $x$ -intercept(s):  $3x^2 + 2y^2 + 4xy - 12 = 0$

- (a)  $\pm\sqrt{6}$  (b)  $\pm 2$  (c) 4  
 (d) 6 (e) None of these

**1—M—Answer:**

4. Find the  $x$ -intercept(s):  $y = 2x^2 - 1$

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

**1—M—Answer:**

5. Find the  $x$ -intercept(s):  $y = x^3(x + 2)(3x - 1)$

- (a)  $0, -2, \frac{1}{3}$  (b) 0 (c)  $0, 2, -1$   
 (d)  $-2, \frac{1}{3}$  (e) There are no  $x$ -intercepts.

**1—M—Answer:**

6. Find the intercepts:  $y = -4x^2 + 4x - 1$

**1—O—Answer:**

7. Find the intercepts:  $y = x^2 - 2x - 3$

**1—O—Answer:**

8. Find all intercepts:  $y = \frac{x + 2}{x - 3}$

- (a)  $(-2, 0)$  (b)  $(-2, 0), (3, 0)$  (c)  $(0, \frac{2}{3}), (3, 0)$   
 (d)  $(-2, 0), (0, -\frac{2}{3})$  (e) None of these

**1—M—Answer:**

9. Find all intercepts:  $y = \frac{x - 1}{x + 3}$

- (a)  $(1, 0), (0, -\frac{1}{3})$  (b)  $(1, 0)$  (c)  $(-3, 0), (1, 0)$   
 (d)  $(-3, 0), (0, -\frac{1}{3})$  (e) None of these

**1—M—Answer:**

10. Find the intercepts:  $y = \frac{2x - 1}{3 - x}$

**1—O—Answer:**

11. Identify the type(s) of symmetry:  $x^4y^2 + 2x^2y - 1 = 0$

- (a) To  $x$ -axis                      (b) To  $y$ -axis                      (c) To origin  
(d) Both a and b                      (e) None of these

2—M—Answer:

12. Identify the type(s) of symmetry:  $3x^4 + xy - 2 = 0$

- (a) To  $x$ -axis                      (b) To  $y$ -axis                      (c) To origin  
(d) Both b and c                      (e) No symmetry

2—M—Answer:

13. Identify the type(s) of symmetry:  $y = x^3 + 3x$

- (a) To  $x$ -axis                      (b) To  $y$ -axis                      (c) To origin  
(d) Both a and b                      (e) No symmetry

2—M—Answer:

14. Identify the type(s) of symmetry:  $y = |x| - 2$

2—O—Answer: Symmetric to the  $y$ -axis

15. Identify the type(s) of symmetry:  $x^2 + xy + y^2 = 0$

2—O—Answer:

16. Determine if  $y = \frac{x}{x^2 - 4}$  is symmetrical with respect to the  $x$ -axis, the  $y$ -axis, or the origin.

- (a) About the  $x$ -axis                      (b) About the  $y$ -axis                      (c) About the origin  
(d) All of these                      (e) None of these

2—M—Answer:

17. Determine if  $y = \frac{x^2}{x^2 - 4}$  is symmetrical with respect to the  $x$ -axis, the  $y$ -axis, or the origin.

- (a) About the  $x$ -axis                      (b) About the  $y$ -axis                      (c) About the origin  
(d) All of these                      (e) None of these

2—M—Answer:

18. Show that  $y = \frac{x}{x^2 + 1}$  is symmetric with respect to the origin.

2—O—Answer:

19. Find all points of intersection of the graphs of  $x^2 - 2x - y = 6$  and  $x - y = -4$ .

- (a)  $(0, -6), (0, 4)$                       (b)  $(10, 14), (13, 17)$                       (c)  $(5, 9), (-2, 2)$   
 (d)  $(-5, -1), (2, 6)$                       (e) None of these

1—M—Answer:

20. Find all points of intersection of the graphs of  $x^2 + 3x - y = 3$  and  $x + y = 2$ .

- (a)  $(5, -3), (1, 1)$                       (b)  $(0, -3), (0, 2)$                       (c)  $(-5, -3), (1, 1)$   
 (d)  $(-5, 7), (1, 1)$                       (e) None of these

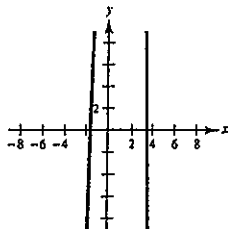
1—M—Answer:

21. Find all points of intersection:  $y = -x^2 + 4x$  and  $y = x^2$

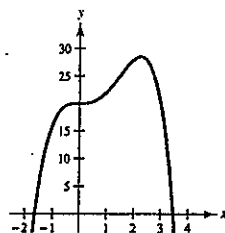
1—O—Answer:

22. Use a graphing utility to graph the equation  $y = -x^4 + 3x^3 + 20$ .

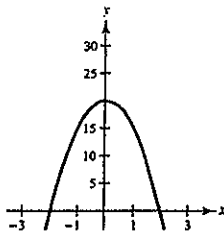
(a)



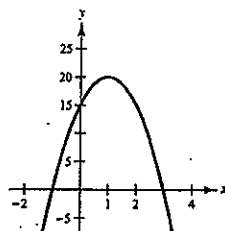
(b)



(c)



(d)



(e) None of these

1—M—T—Answer:

23. a. Use a graphing utility to graph the equation  $y = x^4 - 3x^2 + 2$ .  
b. Identify the intercepts of the graph.  
c. Test for symmetry.

2—O—T—Answer:

24. Create an equation whose graph has intercepts at  $(-5, 0)$ ,  $(0, 0)$ , and  $(5, 0)$ .

1—O—Answer:

25. Sketch the graph of a curve that is symmetric with respect to the  $x$ -axis and has intercepts at  $(0, 3)$ ,  $(0, -3)$  and  $(2, 0)$ .

1—O—Answer:

(There is more than one correct answer.)

26. If the point  $(-3, \frac{1}{2})$  lies on the graph of the equation  $2x + ky = -11$ , find the value of  $k$ .

(a)  $-\frac{5}{2}$

(b)  $-34$

(c)  $-\frac{17}{2}$

(d)  $-10$

(e) None of these

1—M—Answer:

27. If the point  $(-1, 1)$  lies on the graph of the equation  $kx^2 - xy + y^2 = 5$ , find the value of  $k$ .

(a) 7

(b) 3

(c) 5

(d)  $-3$

(e) None of these

1—M—Answer:

**28.** Find the number of sales necessary to break even for the cost  $C$  of  $x$  units and the revenue  $R$  obtained by selling  $x$  units if  $C = 1000x + 75000$  and  $R = 1250x$ .

- (a) 3000 (b) 34 (c) 300  
(d) 30 (e) None of these

**1—M—Answer:**

**29.** Find the points of intersection of the graphs of the equations  $y = x^2 + 1$  and  $y = 2x + 16$ .

- (a)  $(-5, 6)$  and  $(3, 22)$  (b)  $(5, 26)$  and  $(-3, 10)$  (c)  $(-5, 10)$  and  $(3, 0)$   
(d)  $(0, 1)$  and  $(0, 16)$  (e) None of these

**2—M—Answer:**

**30.** Find the  $x$ -intercepts for the graph of  $y = 3x^5 + 4x^4 - 2x^3$ .

- (a)  $(0, 0)$ ,  $(-2, 0)$ ,  $(\frac{1}{3}, 0)$  (b)  $(0, 0)$  (c)  $(0, 0)$ ,  $(2, 0)$ ,  $(-1, 0)$   
(d)  $(-2, \frac{1}{3})$  (e) There are no  $x$ -intercepts.

**1—M—Answer:**

**31.** Write an equation for a graph that is symmetric with respect to the  $y$ -axis.

**1—O—Answer:** Answers will vary. One example

**32.** Sketch the graph of the equation  $y = x^2 - 3x + 2$ . Label the intercepts on the sketch.

**1—O—Answer:**

**P.2** Linear Models and Rates of Change

1. Find the slope of the line passing through the points (6, 10) and (-1, 4).

- (a)  $\frac{7}{6}$  (b)  $-\frac{7}{6}$  (c)  $\frac{6}{7}$   
(d)  $-\frac{6}{7}$  (e) None of these

1—M—Answer:

2. Find the slope of the line passing through the points (-1, 16) and (4, 2).

- (a)  $-\frac{5}{14}$  (b)  $-\frac{14}{5}$  (c)  $\frac{5}{14}$   
(d)  $\frac{14}{5}$  (e) None of these

1—M—Answer:

3. Find the slope of the line passing through the points (3, -2) and (5, 7).

- (a)  $-\frac{9}{2}$  (b)  $\frac{9}{2}$  (c)  $\frac{5}{2}$   
(d)  $\frac{2}{9}$  (e) None of these

1—M—Answer:

4. Find the slope of the line passing through the points (5, 9) and (-1, -3).

1—O—Answer:

5. Find the slope of the line passing through the points (3, 7) and (-1, -2).

1—O—Answer:

6. Find the slope of a line that is perpendicular to the line given by  $2x + 3y + 9 = 0$ .

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

1—M—Answer:

7. Find the equation of the line that has a slope of  $-\frac{3}{4}$  passes through the point (1, 2).

- (a)  $3x - 4y - 7 = 0$  (b)  $3x - 4y - 11 = 0$  (c)  $3x + 4y - 11 = 0$   
(d)  $3x + 4y + 11 = 0$  (e) None of these

1—M—Answer:

8. Find the equation of the vertical line that passes through the point (2, 5).

- (a)  $y = 2$  (b)  $y = 5$  (c)  $x = 2$   
(d)  $x = 5$  (e) None of these

1—M—Answer:

9. Find the equation of the line that passes through the point  $(0, 0)$  and has a slope that is undefined.

(a)  $y = 0$

(b)  $x = 0$

(c)  $x + y = 0$

(d)  $x = y$

(e) None of these

1—M—Answer:

10. Find the equation of the line that passes through the point  $(-1, 5)$  and has a slope of 2.

1—O—Answer:

11. Write the equation of the line having the following data points:

x	-3	0	3	6
y	-11	-5	1	7

2—O—Answer:

12. Find the equation of the line that passes through the point  $(1, 3)$  and is perpendicular to the line  $2x + 3y + 5 = 0$ .

(a)  $3x - 2y + 3 = 0$

(b)  $2x + 3y - 11 = 0$

(c)  $2x + 3y - 9 = 0$

(d)  $3x - 2y - 7 = 0$

(e) None of these

2—M—Answer:

13. Find the equation of the line that passes through the point  $(2, -1)$  and is parallel to the line  $2x + 7y = 5$ .

(a)  $2x - 7y - 11 = 0$

(b)  $2x + 7y + 3 = 0$

(c)  $2x + 7y - 12 = 0$

(d)  $7x - 2y - 16 = 0$

(e) None of these

2—M—Answer:

14. Find the equation of the line that passes through the point  $(-3, -2)$  and is parallel to the line  $3x + 2y - 5 = 0$ .

2—O—Answer:

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

(a)  $y = \frac{2}{3}x - 1$

(b)  $3x + 2y + 2 = 0$

(c)  $2x + 3y = 10$

(d)  $3x + 2y = 10$

(e) None of these

2—M—Answer:

16. Find an equation in general form for the straight line that passes through the point  $(-1, 4)$  and is perpendicular to the line  $2x + 3y = 6$ .

2—O—Answer:



17. 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)  $y = \frac{2}{3}x - 1$

(e) None of these

2—M—Answer:

18. Find an equation for the straight line that passes through the point  $(2, 3)$  and is parallel to  $x = 4$ .

1—O—Answer:

19. Find an equation of the line through the point  $(2, 4)$  perpendicular to the line through the points  $(6, 10)$  and  $(8, 7)$ .

(a)  $y = -\frac{3}{2}(x - 2) + 4$

(b)  $y = -\frac{3}{2}(x - 6) + 10$

(c)  $y = \frac{2}{3}(x - 6) + 10$

(d)  $y = \frac{2}{3}(x - 2) + 4$

(e) None of these

2—M—Answer:

20. Find the equation of the line through the point  $(3, 1)$  perpendicular to the line through the points  $(8, 9)$  and  $(10, 6)$ .

(a)  $y = -\frac{3}{2}(x - 8) + 9$

(b)  $y = \frac{2}{3}(x - 3) + 1$

(c)  $y = \frac{2}{3}(x - 8) + 9$

(d)  $y = -\frac{3}{2}(x - 3) + 1$

(e) None of these

2—M—Answer:

21. Find the equation of the line through the point  $(1, 5)$  perpendicular to the line through the points  $(9, 10)$  and  $(11, 7)$ .

(a)  $y = \frac{2}{3}(x - 1) + 5$

(b)  $y = -\frac{3}{2}(x - 1) + 5$

(c)  $y = -\frac{3}{2}(x - 9) + 10$

(d)  $y = \frac{2}{3}(x - 9) + 10$

(e) None of these

2—M—Answer:

22. Find the equation of the line through the point  $(4, 2)$  perpendicular to the line through the points  $(9, 7)$  and  $(11, 4)$ .

(a)  $y = \frac{2}{3}(x - 9) + 7$

(b)  $y = -\frac{3}{2}(x - 9) + 7$

(c)  $y = -\frac{3}{2}(x - 4) + 2$

(d)  $y = \frac{2}{3}(x - 4) + 2$

(e) None of these

2—M—Answer:

23. Calculate the distance between the lines given by  $y = -1$  and  $y = 5$ .

1—O—Answer:

24. A business had annual sales of \$110,000 in 1992 and \$224,000 in 1995. Assuming that the annual increase in sales followed by a linear pattern, what were the retail sales in 1994?

(a) \$182,000

(b) \$195,000

(c) \$188,000

(d) \$186,000

(e) None of these

2—M—Answer:

25. A business had annual retail sales of \$124,000 in 1992 and \$211,000 in 1995. Assuming that the annual increase in sales follows a linear pattern:
- Calculate the average rate of change of the sales per year.
  - Write a linear equation giving sales  $S$  in terms of the year  $t$  where  $t = 0$  corresponds to 1992.
  - Use the linear equation to predict retail sales in 2000.

2—O—Answer:

26. Find an equation for the horizontal line that passes through the point  $(-3, 2)$ .

(a)  $x = 2$

(b)  $y = 2$

(c)  $x = -3$

(d)  $y = -3$

(e) None of these

1—M—Answer:

27. Sketch the graph of the equation  $4x - 2y + 8 = 0$ .

1—O—Answer:

28. Sketch the graph of the equation  $y = -2$ .

1—O—Answer:

29. Sketch the graph of the equation  $y = 3x - 2$ .

1—O—Answer:

30. During the first and second quarters of the year, a business had sales of \$150,000 and \$185,000, respectively. If the growth of sales follows a linear pattern, what will sales be during the fourth quarter?

(a) \$220,000                      (b) \$235,000                      (c) \$335,000  
(d) \$255,000                      (e) None of these

2—M—Answer:

31. A student working for a telemarket company gets paid \$3 per hour plus \$1.50 for each sale. Let  $x$  represent the number of sales the student has in an 8-hour day.

a. Write a linear equation giving the day's salary  $S$  in terms of  $x$ .  
b. Use the linear equation to calculate the student's salary on Wednesday if the student makes 14 sales that day.  
c. Use the linear equation to calculate the number of sales the student would have to make in order to earn at least \$100 a day.

2—O—Answer: a.

b.

c.

32. A telephone call costs \$0.42 for the first minute plus \$0.30 for each additional minute. Write a linear equation giving the cost  $C$  of a call lasting  $x$  minutes.

(a)  $C = 0.42 + 0.30(x - 1)$                       (b)  $C = 0.72x$                       (c)  $C = 0.42x + 0.30$   
(d)  $C = 0.42 + 0.30x$                       (e) None of these

1—M—Answer:

33. A business had annual retail sales of \$224,000 in 1989 and \$186,500 in 1992. Assume the annual decrease in sales follows a linear pattern.

a. Write a linear equation giving sales  $S$  in terms of the year  $t$  where  $t = 0$  corresponds to 1989.  
b. Use a graphing utility to graph the equation.  
c. Use the graph to estimate the annual retail sales for 1994 to two digits of precision (the nearest multiple of \$10,000).  
d. Use the graph to determine the first year when there will be no sales.

2—O—T—Answer

34. Find the point that does not lie on the line determined by the points  $(-5, 2)$  and  $(1, -3)$ .

(a)  $(0, -4)$                       (b)  $(7, -8)$                       (c)  $(-11, 7)$   
(d)  $(-2, -\frac{1}{2})$                       (e)  $(13, -13)$

2—M—Answer:

35. Find the point that lies on the line determined by the points  $(1, -3)$  and  $(-2, -4)$ .

- (a)  $(3, -2)$  (b)  $(-1, -1)$  (c)  $(10, 0)$   
 (d)  $(-4, 2)$  (e)  $(4, -2)$

2—M—Answer:

36. Find the point that lies on the line determined by the points  $(1, -2)$  and  $(-3, 1)$ .

- (a)  $(0, 0)$  (b)  $(5, 1)$  (c)  $(4, -6)$   
 (d)  $(5, -5)$  (e)  $(-2, 0)$

2—M—Answer:

37. Determine the slope of the line given by the equation  $9x - 5y = 11$ .

- (a)  $\frac{5}{9}$  (b)  $-\frac{5}{9}$  (c)  $\frac{9}{5}$   
 (d)  $-\frac{9}{5}$  (e)  $-9$

1—M—Answer:

38. Determine the slope of the line given by the equation  $7x + 4y - 6 = 0$ .

- (a)  $\frac{7}{4}$  (b)  $\frac{4}{7}$  (c)  $-7$   
 (d)  $-\frac{7}{4}$  (e)  $\frac{3}{2}$

1—M—Answer:

39. Find two additional points on the line that passes through the point  $(4, -5)$  and has slope  $m = -\frac{4}{3}$ .

2—O—Answer: Answers will vary. Some points are

40. The dollar value of a product in 1998 is \$1430. The value of the product is expected to increase \$83 per year for the next 5 years. Write a linear equation that gives the dollar value  $V$  of the product in terms of the year  $t$ . (Let  $t = 8$  represent 1998.)

- (a)  $V = 1430 + 83(t - 8)$  (b)  $V = 83 + 1430t$  (c)  $V = 1430 + 83t$   
 (d)  $V = 83 + 1430(t + 8)$  (e)  $V = 1430 + 83(t + 8)$

1—M—Answer:

41. The dollar value of a product in 1998 is \$78. The value of the product is expected to decrease \$5.75 per year for the next 5 years. Write a linear equation that gives the dollar value  $V$  of the product in terms of the year  $t$ . (Let  $t = 8$  represent 1998.)

- (a)  $V = 78 - 5.75t$  (b)  $V = 78 + 5.75t$  (c)  $V = 78 + 5.75(t - 8)$   
 (d)  $V = 78 - 5.75(t - 8)$  (e)  $V = 5.75 - 78(t - 8)$

1—M—Answer:

**P.3** **Functions and Their Graphs**

1. Find the domain of the function:  $y = \frac{1}{x}$ .

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

1—M—Answer:

2. Find the domain of the function:  $f(x) = \sqrt{2x + 3}$ .

- (a)  $[0, \infty)$                       (b)  $(0, \infty)$                       (c)  $[-\frac{3}{2}, \infty)$   
 (d)  $(-\frac{3}{2}, \infty)$                       (e) None of these

1—M—Answer:

3. Find the domain of the function:  $f(x) = \frac{1}{x + 2}$ .

1—O—Answer: Domain:

4. Find the domain of the function:  $f(x) = \frac{1}{\sqrt{3 - 2x}}$ .

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

1—M—Answer:

5. Find the domain of  $f(x) = \frac{1}{\sqrt{3 + 2x}}$ .

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

1—M—Answer:

6. Find the domain:  $f(x) = \frac{1}{x^2 - 2x - 2}$ .

1—O—Answer:

7. In which of the following equations is  $y$  a function of  $x$ ?

- (a)  $3y + 2x - 9 = 17$                       (b)  $2x^2y + x = 4y$                       (c) Both a and b  
 (d) Neither a nor b                      (e) None of these

1—M—Answer:

8. In which of the following equations is  $y$  a function of  $x$ ?

- (a)  $2x + 3y - 1 = 0$                       (b)  $x^2 + 3y^2 = 7$                       (c)  $2x^2y = 7$   
 (d) Both a and b                              (e) Both a and c

1—M—Answer: . . .

9. In which of the following equations is  $y$  a function of  $x$ ?

- (a)  $3y + 2x - 7 = 0$                       (b)  $5x^2y = 9 - 2x$                       (c)  $3x^2 - 4y^2 = 9$   
 (d)  $x = 3y^2 - 1$                               (e) None of these

1—M—Answer . . .

10. In which of the following equations is  $y$  a function of  $x$ ?

- (a)  $y = 3x^2 - 9$                               (b)  $x^2 + y^2 = 7$                               (c)  $x^2 - y^2 = 2$   
 (d)  $3x + 2y = 5$                               (e)  $|x| = y$

1—M—Answer: . . .

11. Given  $f(x) = x^2 - 3x + 4$ , find  $f(x + 2) - f(2)$ .

- (a)  $x^2 - 3x + 4$                               (b)  $x^2 + x$                                       (c)  $x^2 + x - 8$   
 (d)  $x^2 - 3x - 4$                               (e) None of these

2—M—Answer:

12. Given  $f(x) = |x - 3| - 5$ , find  $f(1) - f(5)$ .

- (a) 0    (b) -4    (c) 14  
 (d) -14    (e) None of these

2—M—Answer:

13. Given  $f(x) = |3x + 1| - 5$ , find  $f(x + 1) - f(x)$ .

- (a) 3    (b) -5    (c)  $|3x + 4| - |3x + 1| - 10$   
 (d)  $|3x + 4| - |3x + 1|$                       (e) None of these

2—M—Answer:

14. Given  $f(x) = 3x - 7$ , find  $f(x + 1) + f(2)$ .

2—O—Answer: . . .

15. Given  $f(x) = |3x - 6|$ , find  $f(0) - f(3)$ .

2—O—Answer:

16. Find  $f(x + \Delta x)$  for  $f(x) = x^3 + 1$ .

(a)  $x^3 + 1 + \Delta x$

(b)  $x^3 + 3x^2(\Delta x) + 3x(\Delta x)^2 + (\Delta x)^3 + 1$

(c)  $x^3 + (\Delta x)^3 + 1$

(d)  $\Delta^3 x^6 + 1$

(e) None of these

1—M—Answer:

17. Find  $f(x + \Delta x)$  for  $f(x) = x^2 - 2x - 3$ .

(a)  $x^2 - x - 3 + \Delta x$

(b)  $x^2 + 2x(\Delta x) + (\Delta x)^2 - 2x - 2\Delta x - 3$

(c)  $x^2 - 2x - 3 + \Delta x$

(d) 5

(e) None of these

1—M—Answer:

18. If  $f(x) = 3 - x^2$ , find:

a.  $f(3)$

b.  $f(-1)$

c.  $f(2 + \Delta x)$

1—O—Answer: a.      b.      c.

19. If  $g(x) = x^2 + 3x - 1$ , find  $\frac{g(x + \Delta x) - g(x)}{\Delta x}$ .

1—O—Answer:

20. Find  $\frac{f(x + \Delta x) - f(x)}{\Delta x}$  if  $f(x) = 8x^2 + 1$ .

(a)  $8(\Delta x)^2 + 1$

(b)  $8\Delta x + \frac{1}{\Delta x}$

(c)  $16x + 8\Delta x$

(d)  $16x(\Delta x) + 8(\Delta x)^2$

(e) None of these

1—M—Answer:

21. Find  $\frac{f(x + \Delta x) - f(x)}{\Delta x}$  if  $f(x) = 9x^2 - 5$ .

(a)  $18x(\Delta x) + 9(\Delta x)^2$

(b)  $18x + 9\Delta x$

(c)  $9\Delta x - \frac{5}{\Delta x}$

(d)  $9(\Delta x)^2 - 5$

(e) None of these

1—M—Answer:

22. Find  $\frac{f(x + \Delta x) - f(x)}{\Delta x}$  if  $f(x) = 4x^2 - 2$ .

(a)  $8x(\Delta x) + 4(\Delta x)^2$

(b)  $8x + 4\Delta x$

(c)  $4(\Delta x)^2 - 2$

(d)  $4\Delta x - \frac{2}{\Delta x}$

(e) None of these

1—M—Answer:

23. Find  $\frac{f(x + \Delta x) - f(x)}{\Delta x}$  if  $f(x) = 2x^2 + 3$ .

(a)  $4x + 2\Delta x$

(b)  $2(\Delta x)^2 + 3$

(c)  $2\Delta x + \frac{3}{\Delta x}$

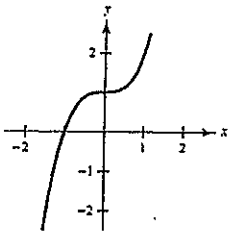
(d)  $4x(\Delta x) + 2(\Delta x)^2$

(e) None of these

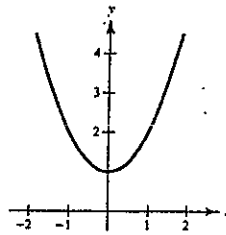
1—M—Answer:

24. Which of the following is a sketch of the graph of the equation  $f(x) = x^3 + 1$ ?

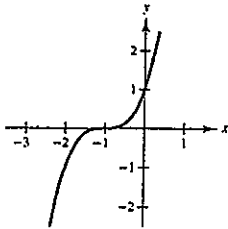
(a)



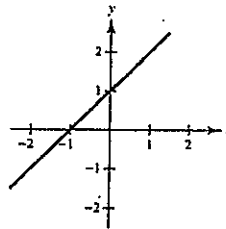
(b)



(c)



(d)



(e) None of these

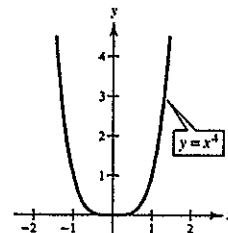
1—M—Answer:

25. Sketch a graph of  $f(x) = x^3 - 1$ .

1—O—Answer:

26. Given the graph of  $y = x^4$ , sketch the graph of  $y = (x - 2)^4 + 6$ .

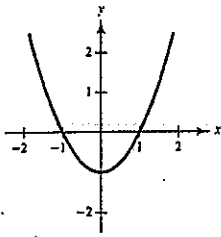
2—O—Answer:



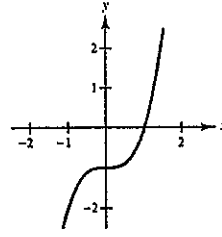


27. Which of the following is a sketch of the graph of the equation  $f(x) = (x - 1)^3$ ?

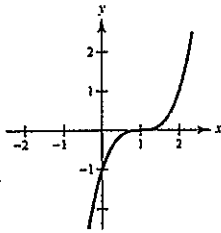
(a)



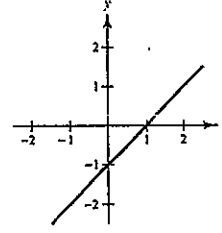
(b)



(c)



(d)

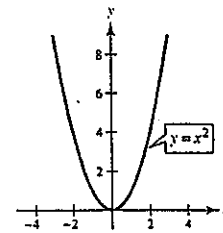


(e) None of these

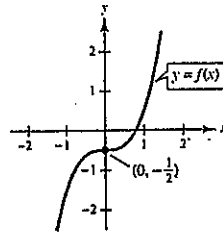
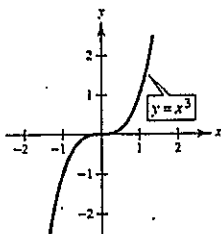
1—M—Answer:

28. Given the graph of  $y = x^2$ , sketch the graph of  $y = (x + 3)^2 - 1$ .

2—O—Answer:



29. Use the graph of  $y = x^3$  to find a formula for the function  $y = f(x)$ .



(a)  $y = (x - \frac{1}{2})^3$

(b)  $y = (x + \frac{1}{2})^3$

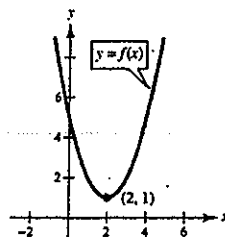
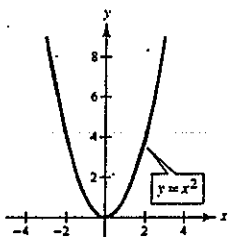
(c)  $y = x^3 - \frac{1}{2}$

(d)  $y = x^3 + \frac{1}{2}$

(e) None of these

2—M—Answer:

30. Use the graph of  $y = x^2$  to find a formula for the function  $y = f(x)$ .



- (a)  $f(x) = (x - 2)^2 + 1$       (b)  $f(x) = (x - 1)^2 + 2$       (c)  $f(x) = (x + 2)^2 + 1$   
 (d)  $f(x) = (x + 1)^2 - 2$       (e) None of these

2—M—Answer:

31. Is the following function even or odd?  $f(x) = 3x^4 - x^2 + 2$

- (a) Odd      (b) Even      (c) Both      (d) Neither

1—M—Answer:

32. Is the following function even or odd?  $y = -x^4 + 2x^2 - 1$

1—O—Answer:

33. If  $f(x) = \frac{1}{\sqrt{x}}$  and  $g(x) = 1 - x^2$ , find  $f(g(x))$ .

- (a)  $\frac{1 - x^2}{\sqrt{x}}$       (b)  $\frac{1}{\sqrt{1 - x^2}}$       (c)  $1 - \frac{1}{x}$   
 (d)  $\frac{1}{\sqrt{x}} + 1 - x^2$       (e) None of these

1—M—Answer:

34. If  $f(x) = 1 - x^2$  and  $g(x) = \frac{1}{\sqrt{x}}$ , find  $f(g(x))$ .

- (a)  $\frac{1 - x^2}{\sqrt{x}}$       (b)  $\frac{1}{\sqrt{1 - x^2}}$       (c)  $1 - \frac{1}{x}$   
 (d)  $\frac{1}{\sqrt{x}} + 1 - x^2$       (e) None of these

1—M—Answer:

35. If  $f(x) = \frac{1}{\sqrt{x}}$  and  $g(x) = x^2 - 5$ , find  $g(f(x))$ .

1—O—Answer:

36. Given  $f(x) = 7x + 2$  and  $g(x) = x^2 - 9$ , find the product  $f(x)g(x)$ .

(a)  $7x^3 + 2x^2 - 63x - 18$

(b)  $7x^3 - 18$

(c)  $2x^2 + 7x - 7$

(d)  $7x^2 - 61$

(e) None of these

1—M—Answer:

37. Given  $f(x) = 6x - 12$  and  $g(x) = x^2 - 4$ , find  $\frac{f(x)}{g(x)}$ .

(a)  $\frac{6}{x-2}$

(b)  $\frac{6(x-2)}{x+2}$

(c)  $\frac{6}{(x-2)(x+2)}$

(d)  $\frac{6}{x+2}$

(e) None of these

1—M—Answer:

38. Given  $f(x) = 2x^2 + 1$  and  $g(x) = x - 2$ , find  $(f \circ g)(x)$ .

(a)  $x^2 - 7$

(b)  $2x^2 + x - 1$

(c)  $2x^2 - 1$

(d)  $2x^2 - 8x + 9$

(e) None of these

1—M—Answer:

39. Given  $f(x) = 2x^2 + 1$  and  $g(x) = x + 2$ , find  $(f \circ g)(x)$ .

(a)  $2x^2 + 5$

(b)  $2x^2 + 3$

(c)  $2x^2 + 4x + 5$

(d)  $2x^2 + 8x + 9$

(e) None of these

1—M—Answer:

40. Given  $f(x) = 7x^2 - 3$  and  $g(x) = 9 - 2x$ , find  $(g \circ f)(x)$ .

1—O—Answer:

41. Given  $f(x) = x - 2$  and  $g(x) = \frac{x+5}{3}$ , find  $(g \circ f)(x)$ .

(a)  $\frac{x-1}{3}$

(b)  $\frac{x+3}{3}$

(c)  $\frac{x^2 + 3x - 10}{3}$

(d)  $x + 1$

(e) None of these

1—M—Answer:

42. Let  $f(x) = \begin{cases} |x|, & x < 2 \\ x - 3, & x \geq 2 \end{cases}$

Evaluate:

a.  $f(-3)$

b.  $f(-2)$

c.  $f(0)$

d.  $f(2)$

1—O—Answer: a.      b.      c.      d.

43. Let  $f(x) = x + \sqrt{x+2}$

- Use a graphing utility to graph  $y = f(x)$ .
- Estimate the domain and range from the graph.
- Estimate the coordinates of any intercepts of the graph.
- Find the intercepts analytically.

2—O—T—Answer: a.

b.

c.

d.

44. Write an equation for the graph obtained by shifting  $y = 2x - 5$  three units to the left.

- $y = 2x - 8$
- $y = 2x + 1$
- $y = 2x - 11$
- $y = 2x - 2$
- None of these

1—M—Answer:

45. If  $f(x) = x^2$  and  $g(x) = \frac{x+1}{x}$ , find  $g(f(-2))$ .

- $\left(\frac{x+1}{x}\right)^2$
- $\frac{x^2+1}{x^2}$
- $\frac{5}{4}$
- $\frac{1}{4}$
- None of these

1—M—Answer:

46. Let  $f(x) = \frac{1}{\sqrt{x}}$  and  $g(x) = 2x + 3$ . Find the domain of  $(f \circ g)(x)$ .

- $x \geq -\frac{3}{2}$
- $x > 0$
- $x < \frac{2}{3}$
- $x > -\frac{3}{2}$
- None of these

2—M—Answer:

47. Use a graphing utility to estimate the zero(s) of  $f(x) = x^3 - 5x + 2$ .

1—O—T—Answer:

48. Find the zero(s) of the function  $f(x) = \frac{1}{x-3} + \frac{1}{x-4}$ .

(a) 3 and 4

(b) 0

(c)  $\frac{7}{2}$

(d)  $\frac{2}{7}$

(e) None of these

1—M—Answer:

49. An open box is to be made from a rectangular piece of material 9 inches by 12 inches by cutting equal squares from each corner and turning up the sides. Let  $x$  be the length of each side of the square cut out of each corner. Write the volume  $V$  of the box as a function of  $x$ .

(a)  $V = x^3$

(b)  $V = 108x$

(c)  $V = x(9-x)(12-x)$

(d)  $V = x(9-2x)(12-2x)$

(e) None of these

2—M—Answer:

50. Determine which function is neither even nor odd.

(a)  $f(x) = \tan x$

(b)  $f(x) = 3x^5 + 5x^3 + 1$

(c)  $f(x) = \frac{3}{x^2}$

(d)  $f(x) = \sqrt{x^2 + 1}$

(e) Both a and b

1—M—Answer:

51. Determine the odd function.

(a)  $f(x) = x^5 + x^3 + x + 1$

(b)  $f(x) = \frac{x^3}{x^2 + 1}$

(c)  $f(x) = 3x^2 + 5x - 1$

(d)  $f(x) = \cos x$

(e) None of these

1—M—Answer:

52. Determine the even function.

(a)  $f(x) = \sin x$

(b)  $f(x) = \frac{x^3}{x^2 + 1}$

(c)  $f(x) = 3x^4 + 5x^2 - 1$

(d)  $f(x) = \sqrt{x^3 + 1}$

(e) None of these

1—M—Answer:

53. Describe the transformation needed to sketch the graph of  $y = \frac{1}{x} + 2$  using the graph of  $f(x) = \frac{1}{x}$ .

(a) Shift  $f(x)$  two units to the right.

(b) Shift  $f(x)$  two units to the left.

(c) Shift  $f(x)$  two units upward.

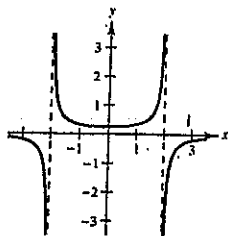
(d) Shift  $f(x)$  two units downward.

(e) Reflect  $f(x)$  about the  $x$ -axis.

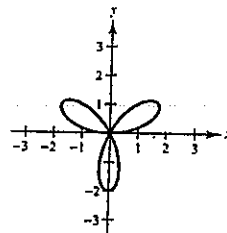
1—M—Answer:

54. Use the vertical line test to determine which of the following graphs does *not* represent  $y$  as a function of  $x$ .

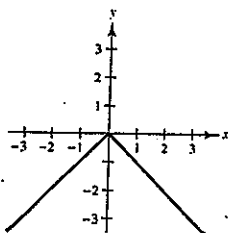
(a)



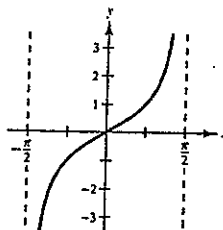
(b)



(c)



(d)



(e) Both a and d

1—M—Answer:

55. Let  $f(x) = \begin{cases} 1 - 2x, & x < 1 \\ -x^2, & x \geq 1 \end{cases}$ . Find  $f(5)$ .

(a) -9

(b) -25

(c) -17

(d) -34

(e) -1

1—M—Answer:

56. Let  $f(x) = \begin{cases} x^2 - 5, & x < 2 \\ 3x + 1, & x \geq 2 \end{cases}$ . Find  $f(1)$ .

(a) -4

(b) -2

(c) 4

(d) 2

(e) 0

1—M—Answer:

57. Determine whether the function is even, odd, or neither. Justify your answer.

$$f(x) = -x^5 + 3x^3 - 2x + 1$$

1—O—Answer:

58. Use the graph of  $f(x) = |x|$  to sketch the graph of  $y = |x - 1| + 3$ .

1—O—Answer:

59. Find the slope and the  $y$ -intercept of the line given by the equation  $5x + 4y - 12 = 0$ .

1—O—Answer: Slope:  $-\frac{5}{4}$ ;  $y$ -intercept:  $(0, 3)$

60. Let  $f(x) = \begin{cases} x^2 - 4, & x < 2 \\ 3 - 2x, & x \geq 2 \end{cases}$ .

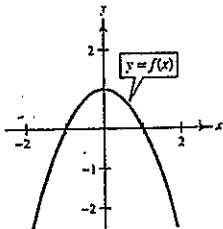
Evaluate: a.  $f(0)$

b.  $f(2)$

c.  $f(3)$

1—O—Answer: a.      b.      c.

61. Use the graph of  $f$  shown below to sketch the graph of  $y = f(x) - 2$ .



1—O—Answer: