EXERCISES 1.7

Choosing a Viewing Window

In Exercises 1–4, use a graphing calculator or computer to determine which of the given viewing windows displays the most appropriate graph of the specified function.

1. $f(x) = x^4 - 7x^2 + 6x$

a. $[-1, 1]$ by $[-1, 1]$ **b.** $[-2, 2]$ by $[-5, 5]$

c. $[-10, 10]$ by $[-10, 10]$ **d.** $[-5, 5]$ by $[-25, 15]$

2. $f(x) = x^3 - 4x^2 - 4x + 16$

a. $[-1, 1]$ by $[-5, 5]$ **b.** $[-3, 3]$ by $[-10, 10]$

c. $[-5, 5]$ by $[-10, 20]$ **d.** $[-20, 20]$ by $[-100, 100]$

3. $f(x) = 5 + 12x - x^3$

a. $[-1, 1]$ by $[-1, 1]$ **b.** $[-5, 5]$ by $[-10, 10]$

c. $[-4, 4]$ by $[-20, 20]$ **d.** $[-4, 5]$ by $[-15, 25]$

4. $f(x) = \sqrt{5 + 4x - x^2}$

a. $[-2, 2]$ by $[-2, 2]$ **b.** $[-2, 6]$ by $[-1, 4]$

c. $[-3, 7]$ by $[0, 10]$ **d.** $[-10, 10]$ by $[-10, 10]$

Determining a Viewing Window

In Exercises 5–30, determine an appropriate viewing window for the given function and use it to display its graph.

5. $f(x) = x^4 - 4x^3 + 15$

6. $f(x) = \dfrac{x^3}{3} - \dfrac{x^2}{2} - 2x + 1$

7. $f(x) = x^5 - 5x^4 + 10$

8. $f(x) = 4x^3 - x^4$

9. $f(x) = x\sqrt{9 - x^2}$

10. $f(x) = x^2(6 - x^3)$

11. $y = 2x - 3x^{2/3}$

12. $y = x^{1/3}(x^2 - 8)$

13. $y = 5x^{2/5} - 2x$

14. $y = x^{2/3}(5 - x)$

15. $y = |x^2 - 1|$

16. $y = |x^2 - x|$

17. $y = \dfrac{x + 3}{x + 2}$

18. $y = 1 - \dfrac{1}{x + 3}$

19. $f(x) = \dfrac{x^2 + 2}{x^2 + 1}$

20. $f(x) = \dfrac{x^2 - 1}{x^2 + 1}$

21. $f(x) = \dfrac{x - 1}{x^2 - x - 6}$

22. $f(x) = \dfrac{8}{x^2 - 9}$

23. $f(x) = \dfrac{6x^2 - 15x + 6}{4x^2 - 10x}$

24. $f(x) = \dfrac{x^2 - 3}{x - 2}$

25. $y = \sin 250x$

26. $y = 3\cos 60x$

27. $y = \cos\left(\dfrac{x}{50}\right)$

28. $y = \dfrac{1}{10}\sin\left(\dfrac{x}{10}\right)$

29. $y = x + \dfrac{1}{10}\sin 30x$

30. $y = x^2 + \dfrac{1}{50}\cos 100x$

31. Graph the lower half of the circle defined by the equation $x^2 + 2x = 4 + 4y - y^2$.

32. Graph the upper branch of the hyperbola $y^2 - 16x^2 = 1$.

33. Graph four periods of the function $f(x) = -\tan 2x$.

34. Graph two periods of the function $f(x) = 3\cot\dfrac{x}{2} + 1$.

35. Graph the function $f(x) = \sin 2x + \cos 3x$.

36. Graph the function $f(x) = \sin^3 x$.

Graphing in Dot Mode

Another way to avoid incorrect connections when using a graphing device is through the use of a “dot mode,” which plots only the points. If your graphing utility allows that mode, use it to plot the functions in Exercises 37–40.

37. $y = \dfrac{1}{x - 3}$

38. $y = \sin\dfrac{1}{x}$

39. $y = x\lfloor x \rfloor$

40. $y = \dfrac{x^3 - 1}{x^2 - 1}$

Regression Analysis

T **41.** Table 1.7 shows the mean annual compensation of construction workers.

TABLE 1.7 Construction workers’ average annual compensation

Year	Annual compensation (dollars)
1980	22,033
1985	27,581
1988	30,466
1990	32,836
1992	34,815
1995	37,996
1999	42,236
2002	45,413

Source: U.S. Bureau of Economic Analysis.

a. Find a linear regression equation for the data.

b. Find the slope of the regression line. What does the slope represent?

c. Superimpose the graph of the linear regression equation on a scatterplot of the data.

d. Use the regression equation to predict the construction workers' average annual compensation in 2010.

T **42.** The median price of existing single-family homes has increased consistently since 1970. The data in Table 1.8, however, show that there have been differences in various parts of the country.

a. Find a linear regression equation for home cost in the Northeast.

b. What does the slope of the regression line represent?

c. Find a linear regression equation for home cost in the Midwest.

d. Where is the median price increasing more rapidly, in the Northeast or the Midwest?

TABLE 1.8 Median price of single-family homes

Year	Northeast (dollars)	Midwest (dollars)
1970	25,200	20,100
1975	39,300	30,100
1980	60,800	51,900
1985	88,900	58,900
1990	141,200	74,000
1995	197,100	88,300
2000	264,700	97,000

Source: National Association of Realtors®

T **43. Vehicular stopping distance** Table 1.9 shows the total stopping distance of a car as a function of its speed.

a. Find the quadratic regression equation for the data in Table 1.9.

b. Superimpose the graph of the quadratic regression equation on a scatterplot of the data.

c. Use the graph of the quadratic regression equation to predict the average total stopping distance for speeds of 72 and 85 mph. Confirm algebraically.

d. Now use *linear* regression to predict the average total stopping distance for speeds of 72 and 85 mph. Superimpose the regression line on a scatterplot of the data. Which gives the better fit, the line here or the graph in part (b)?

TABLE 1.9 Vehicular stopping distance

Speed (mph)	Average total stopping distance (ft)
20	42
25	56
30	73.5
35	91.5
40	116
45	142.5
50	173
55	209.5
60	248
65	292.5
70	343
75	401
80	464

Source: U.S. Bureau of Public Roads.

T **44. Stern waves** Observations of the stern waves that follow a boat at right angles to its course have disclosed that the distance between the crests of these waves (their *wave length*) increases with the speed of the boat. Table 1.10 shows the relationship between wave length and the speed of the boat.

TABLE 1.10 Wave lengths

Wave length (m)	Speed (km/h)
0.20	1.8
0.65	3.6
1.13	5.4
2.55	7.2
4.00	9.0
5.75	10.8
7.80	12.6
10.20	14.4
12.90	16.2
16.00	18.0
18.40	19.8

a. Find a power regression equation $y = ax^b$ for the data in Table 1.10, where x is the wave length, and y the speed of the boat.

b. Superimpose the graph of the power regression equation on a scatterplot of the data.

c. Use the graph of the power regression equation to predict the speed of the boat when the wave length is 11 m. Confirm algebraically.

d. Now use *linear* regression to predict the speed when the wave length is 11 m. Superimpose the regression line on a scatterplot of the data. Which gives the better fit, the line here or the curve in part (b)?