CHAPTER Test Prep VIDEOS

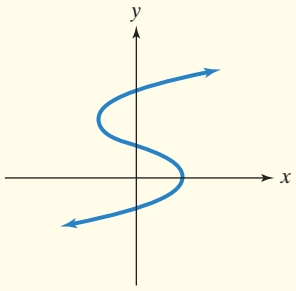
Chapter 1 Test

1. List by letter all relations that are not functions.

a. $\{(7, 5), (8, 5), (9, 5)\}$

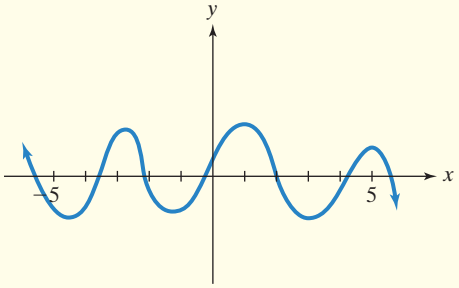
b. $\{(5, 7), (5, 8), (5, 9)\}$

c.

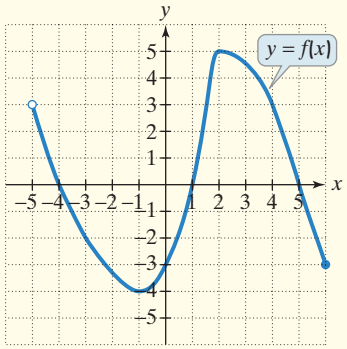


d. $x^2 + y^2 = 100$

e.



2. Use the graph of $y = f(x)$ to solve this exercise.



a. What is $f(4) - f(-3)$?

b. What is the domain of f?

c. What is the range of f?

d. On which interval or intervals is f increasing?

e. On which interval or intervals is f decreasing?

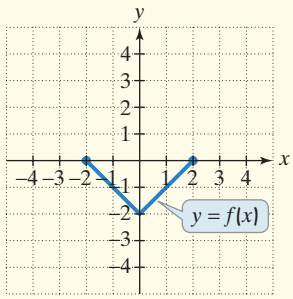
f. For what number does f have a relative maximum? What is the relative maximum?

g. For what number does f have a relative minimum? What is the relative minimum?

h. What are the x-intercepts?

i. What is the y-intercept?

3. Use the graph of $y = f(x)$ to solve this exercise.



a. What are the zeros of f?

b. Find the value(s) of x for which $f(x) = -1$.

c. Find the value(s) of x for which $f(x) = -2$.

d. Is f even, odd, or neither?

e. Does f have an inverse function?

f. Is $f(0)$ a relative maximum, a relative minimum, or neither?

g. Graph $g(x) = f(x + 1) - 1$.

h. Graph $h(x) = \frac{1}{2}f\left(\frac{1}{2}x\right)$.

i. Graph $r(x) = -f(-x) + 1$.

j. Find the average rate of change of f from $x_1 = -2$ to $x_2 = 1$.

In Exercises 4–15, graph each equation in a rectangular coordinate system. If two functions are indicated, graph both in the same system. Then use your graphs to identify each relation's domain and range.

4. $x + y = 4$

5. $x^2 + y^2 = 4$

6. $f(x) = 4$

7. $f(x) = -\frac{1}{3}x + 2$

8. $(x + 2)^2 + (y - 1)^2 = 9$

9. $f(x) = \begin{cases} 2 & \text{if } x \le 0 \\ -1 & \text{if } x > 0 \end{cases}$

10. $x^2 + y^2 + 4x - 6y - 3 = 0$

11. $f(x) = |x|$ and $g(x) = \frac{1}{2}|x + 1| - 2$

12. $f(x) = x^2$ and $g(x) = -(x - 1)^2 + 4$

13. $f(x) = 2x - 4$ and f^{-1}

14. $f(x) = x^3 - 1$ and f^{-1}

15. $f(x) = x^2 - 1$, $x \ge 0$, and f^{-1}

In Exercises 16–23, let $f(x) = x^2 - x - 4$ and $g(x) = 2x - 6$.

16. Find $f(x - 1)$.

17. Find $\dfrac{f(x + h) - f(x)}{h}$.

18. Find $(g - f)(x)$.

19. Find $\left(\dfrac{f}{g}\right)(x)$ and its domain.

20. Find $(f \circ g)(x)$.

21. Find $(g \circ f)(x)$.

22. Find $g(f(-1))$.

23. Find $f(-x)$. Is f even, odd, or neither?

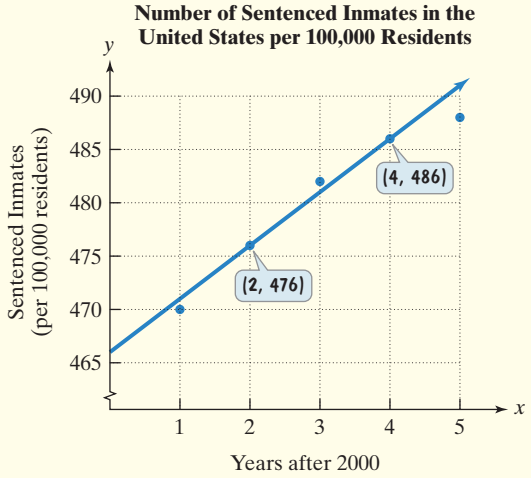
In Exercises 24–25, use the given conditions to write an equation for each line in point-slope form and slope-intercept form.

24. Passing through $(2, 1)$ and $(-1, -8)$

25. Passing through $(-4, 6)$ and perpendicular to the line whose equation is $y = -\frac{1}{4}x + 5$

26. Write an equation in general form for the line passing through $(-7, -10)$ and parallel to the line whose equation is $4x + 2y - 5 = 0$.

27. The scatter plot shows the number of sentenced inmates in the United States per 100,000 residents from 2001 through 2005. Also shown is a line that passes through or near the data points.



Source: U.S. Justice Department

a. Use the two points whose coordinates are shown by the voice balloons to find the point-slope form of the equation of the line that models the number of inmates per 100,000 residents, y, x years after 2000.

b. Write the equation from part (a) in slope-intercept form. Use function notation.

c. Use the linear function to predict the number of sentenced inmates in the United States per 100,000 residents in 2010.

28. Find the average rate of change of $f(x) = 3x^2 - 5$ from $x_1 = 6$ to $x_2 = 10$.

29. If $g(x) = \begin{cases} \sqrt{x-3} & \text{if } x \geq 3 \\ 3 - x & \text{if } x < 3 \end{cases}$, find $g(-1)$ and $g(7)$.

In Exercises 30–31, find the domain of each function.

30. $f(x) = \dfrac{3}{x+5} + \dfrac{7}{x-1}$

31. $f(x) = 3\sqrt{x+5} + 7\sqrt{x-1}$

32. If $f(x) = \dfrac{7}{x-4}$ and $g(x) = \dfrac{2}{x}$, find $(f \circ g)(x)$ and the domain of $f \circ g$.

33. Express $h(x) = (2x + 3)^7$ as a composition of two functions f and g so that $h(x) = (f \circ g)(x)$.

34. Find the length and the midpoint of the line segment whose endpoints are $(2, -2)$ and $(5, 2)$.

35. In 1980, the winning time for women in the Olympic 500-meter speed skating event was 41.78 seconds. The average rate of decrease in the winning time has been about 0.19 second per year.

a. Express the winning time, T, in this event as a function of the number of years after 1980, x.

b. According to the function, when will the winning time be 35.7 seconds?

36. The annual yield per walnut tree is fairly constant at 50 pounds per tree when the number of trees per acre is 30 or fewer. For each additional tree over 30, the annual yield per tree for all trees on the acre decreases by 1.5 pounds due to overcrowding.

a. Express the yield per tree, Y, in pounds, as a function of the number of walnut trees per acre, x.

b. Express the total yield for an acre, T, in pounds, as a function of the number of walnut trees per acre, x.

37. You have 600 yards of fencing to enclose a rectangular field. Express the area of the field, A, as a function of one of its dimensions, x.

38. A closed rectangular box with a square base has a volume of 8000 cubic centimeters. Express the surface area of the box, A, as a function of the length of a side of its square base, x.