

Exam 3 will be on 11/24/09 and cover the following sections: 3.4, 3.5, 4.3, 4.4, 5.1, 5.2, 5.3.

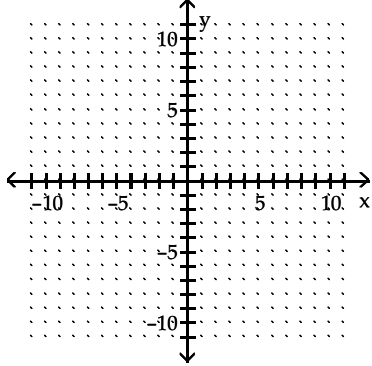
**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Graph the function.**

1)

1)

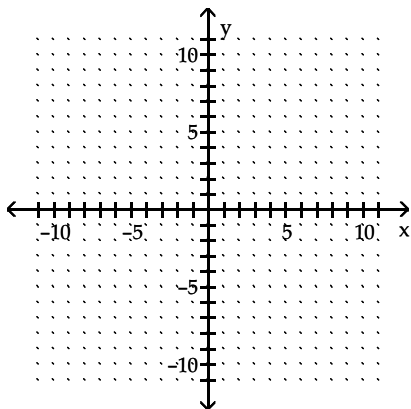
$$f(x) = \begin{cases} 2 - x, & \text{for } x \leq 2 \\ 1 - 3x, & \text{for } x > 2 \end{cases}$$



2)

2)

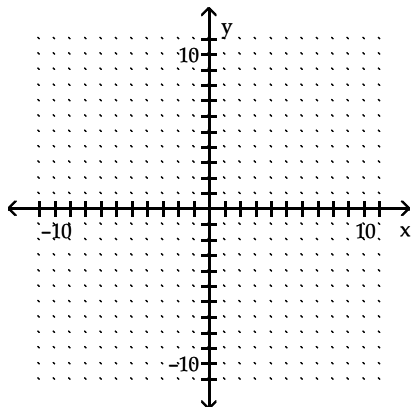
$$y(x) = \begin{cases} 8x + 4, & \text{if } x < 0 \\ 2x^2 - 5, & \text{if } x \geq 0 \end{cases}$$



3)

$$f(x) = \begin{cases} \sqrt{x+3} & \text{for } x \geq 0 \\ 2-x & \text{for } x < 0 \end{cases}$$

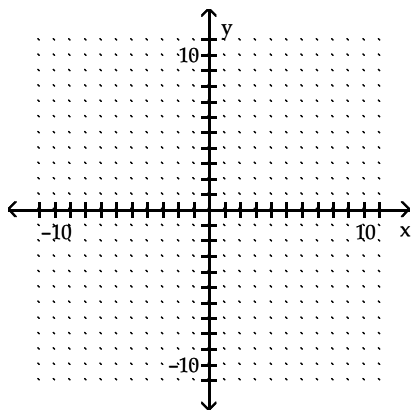
3)



4)

$$f(x) = \begin{cases} \sqrt{x+4} & \text{for } x \geq 0 \\ 4-x & \text{for } x < 0 \end{cases}$$

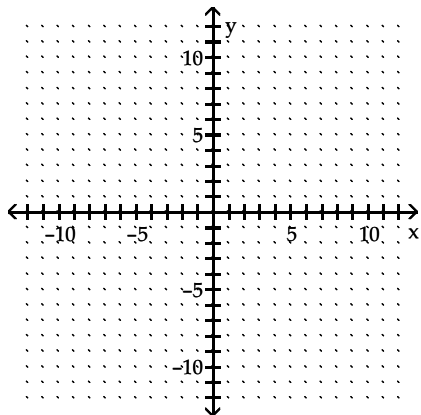
4)



Use one or more transformations to graph the function.

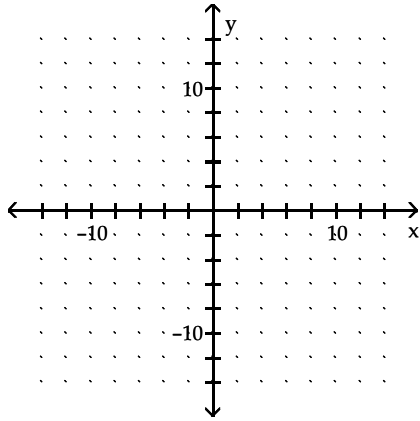
5)  $y = 6|x| - 3$

5)



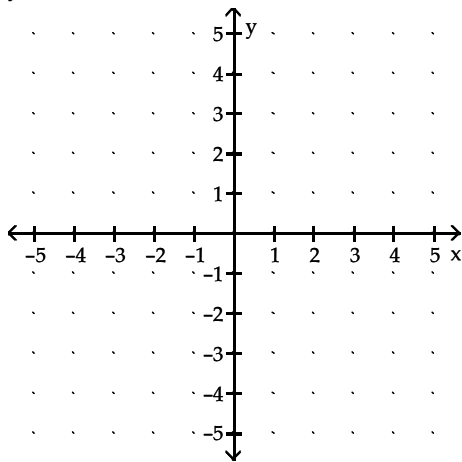
6)  $y = 2\sqrt{x-6} - 4$

6)



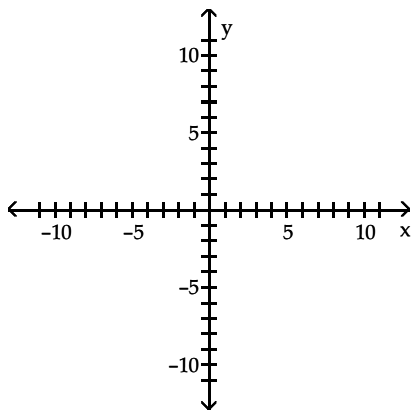
7)  $y = -\sqrt{x+2} + 1$

7)



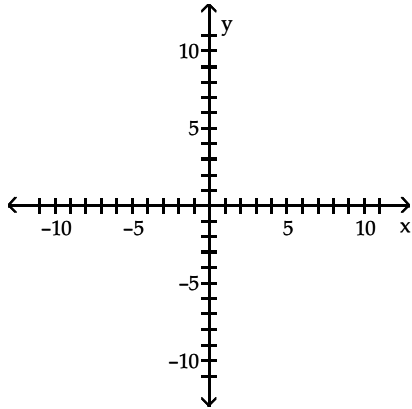
8)  $y = (x - 6)^2 - 4$

8)



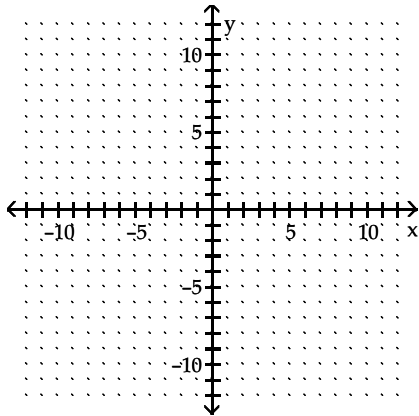
9)  $y = -4(x + 5)^2 + 4$

9)



10)  $y = -2(x + 3)^2 + 5$

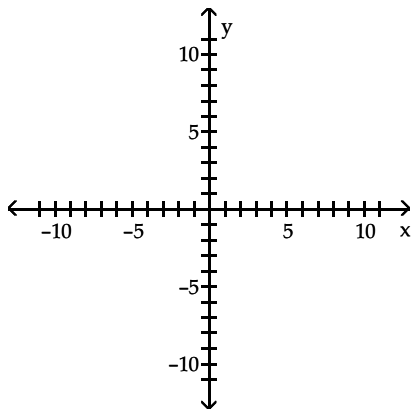
10)



Graph the basic function using a solid line and the transformed function using a dotted line.

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

11)



Identify the vertex of the parabola.

12)  $y = 2x^2 + 12x + 13$

12) \_\_\_\_\_

13)  $y = 2x^2 - 20x + 54$

13) \_\_\_\_\_

14)  $y = 7x^2 - 126x + 577$

14) \_\_\_\_\_

**Find the domain and range of the function.**

15)  $f(x) = -x^2 - 4x - 7$

15) \_\_\_\_\_

16)  $f(x) = x^2 + 20x + 99$

16) \_\_\_\_\_

17)  $f(x) = -5x^2 - 10x - 9$

17) \_\_\_\_\_

**Find the intervals on which the function is increasing and the intervals on which the function is decreasing.**

18)  $f(x) = -3x^2 + 18x + 81$

18) \_\_\_\_\_

19)  $f(x) = -x^2 + 7x - 2$

19) \_\_\_\_\_

20)  $f(x) = \frac{1}{2}x^2 - 6x - \frac{15}{2}$

20) \_\_\_\_\_

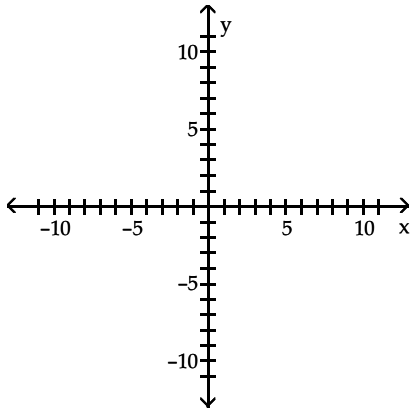
21)  $f(x) = 2x^2 + 8x + 8$

21) \_\_\_\_\_

**Graph.**

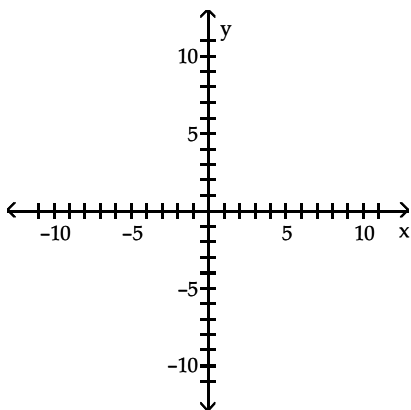
22)  $y = x^2 - 2x - 9$

22)



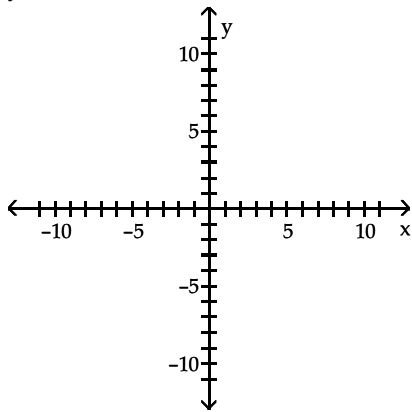
23)  $y = -x^2 + 2x - 7$

23)



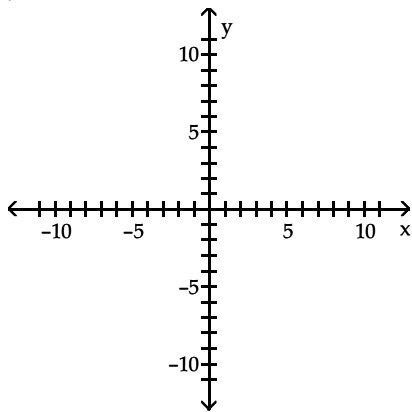
24)  $y = 4x^2 + 2x - 7$

24)



25)  $y = -4x^2 - 2x - 5$

25)



**Solve the problem.**

26) Bob owns a watch repair shop. He has found that the cost of operating his shop is given by  $c(x) = 3x^2 - 204x + 59$ , where  $c$  is cost and  $x$  is the number of watches repaired. How many watches must he repair to have the lowest cost? 26) \_\_\_\_\_

27) John owns a hotdog stand. His profit is represented by the equation  $P(x) = -x^2 + 14x + 58$ , with  $P$  being profits and  $x$  the number of hotdogs sold. What is the most he can earn? 27) \_\_\_\_\_

28) The number of mosquitoes  $M(x)$ , in millions, in a certain area depends on the June rainfall  $x$ , in inches, according to the equation  $M(x) = 11x - x^2$ . What rainfall produces the maximum number of mosquitoes? 28) \_\_\_\_\_

29) The number of mosquitoes  $M(x)$ , in millions, in a certain area depends on the June rainfall  $x$ , in inches, according to the equation  $M(x) = 15x - x^2$ . What rainfall produces the maximum number of mosquitoes? 29) \_\_\_\_\_

30) The polynomial function  $I(t) = -.1t^2 + 1.2t$  represents the yearly income (or loss) from a real estate investment, where  $t$  is time in years. After what year does income begin to decline? 30) \_\_\_\_\_

**Find the correct end behavior diagram for the given polynomial function.**

31)  $P(x) = -x^5 - 3x^3 - 3x + 9$  31) \_\_\_\_\_

32)  $P(x) = \sqrt{5}x^6 - x^5 + 7x^2 - 1$  32) \_\_\_\_\_

Find the zeros of the polynomial function and state the multiplicity of each.

33)  $f(x) = 3x(x - 5)(x + 9)(2x - 1)$

33) \_\_\_\_\_

34)  $f(x) = 2(x + 6)^2(x - 6)^3$

34) \_\_\_\_\_

Describe the behavior of the function's graph at its x-intercepts.

35)  $f(x) = (x - 2)(x + 6)$

35) \_\_\_\_\_

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

36) \_\_\_\_\_

37)  $f(x) = (x - 3)^2(x + 7)$

37) \_\_\_\_\_

38)  $f(x) = (x - 1)^2(x + 6)^2$

38) \_\_\_\_\_

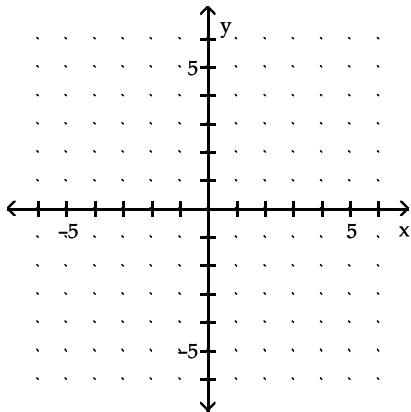
39)  $f(x) = (x - 3)^2(x + 6)$

39) \_\_\_\_\_

Graph the polynomial function. Factor first if the expression is not in factored form.

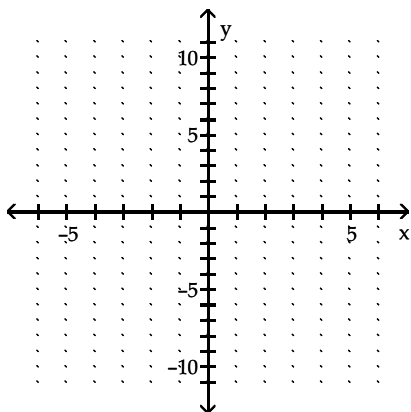
40)  $f(x) = (-3x - 2)(x + 2)^2$

40)



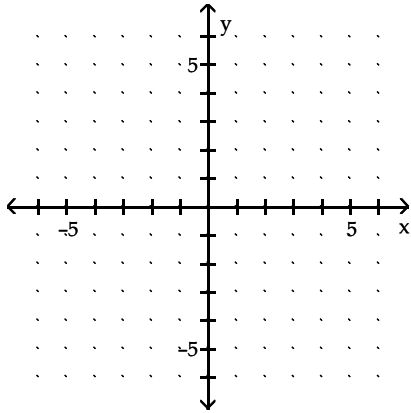
41)  $f(x) = 2x(x - 2)^2(x + 1)^2$

41)



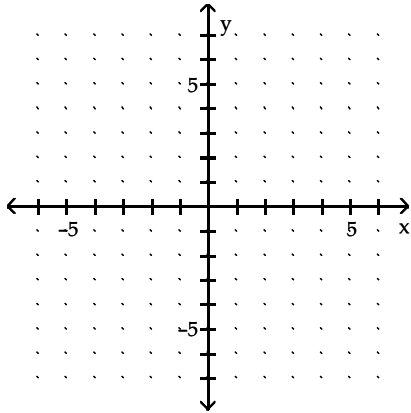
42)  $f(x) = (3x - 2)(x + 2)^2$

42)



43)  $f(x) = -2x(x - 2)^2$

43)



**Find the vertical asymptote(s) of the graph of the given function.**

44)  $h(x) = \frac{x^2 - 100}{(x - 4)(x + 8)}$

44) \_\_\_\_\_

45)  $f(x) = \frac{x - 11}{x^2 - 1}$

45) \_\_\_\_\_

46)  $f(x) = \frac{x - 11}{x^2 - 16}$

46) \_\_\_\_\_

**Find the horizontal asymptote, if any, of the rational function.**

47)  $f(x) = \frac{x + 4}{5x^2 + 2x - 2}$

47) \_\_\_\_\_

48)  $f(x) = \frac{7x^2 + 6}{x^2 - 6}$

48) \_\_\_\_\_

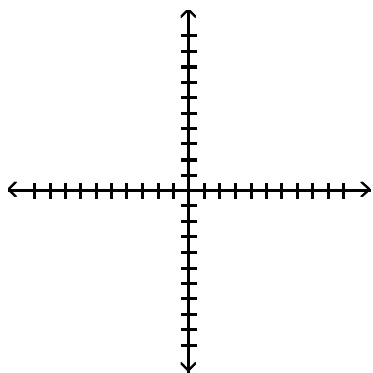
49)  $f(x) = \frac{6x^2 + 3}{6x^2 - 3}$

49) \_\_\_\_\_

Graph the function, showing all asymptotes (those that do not correspond to an axis) as dashed lines. List the x- and y-intercepts.

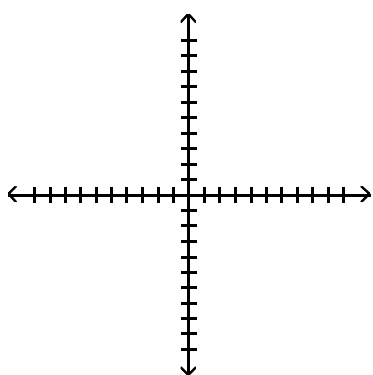
$$50) f(x) = \frac{x + 2}{2x^2 - 3x - 2}$$

50)



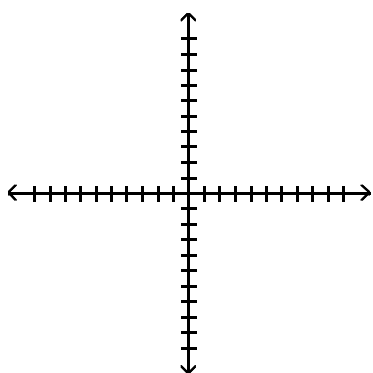
$$51) f(x) = \frac{x + 3}{2x^2 - 5x - 3}$$

51)



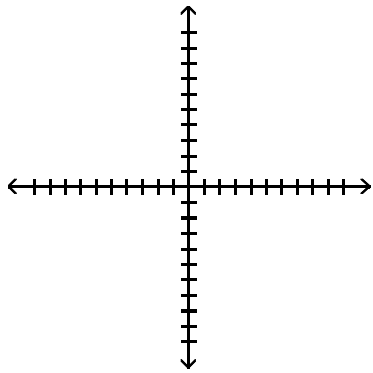
$$52) f(x) = \frac{2x}{x^2 + 4x + 3}$$

52)



53)  $f(x) = \frac{x - 1}{x^2 - 5x - 6}$

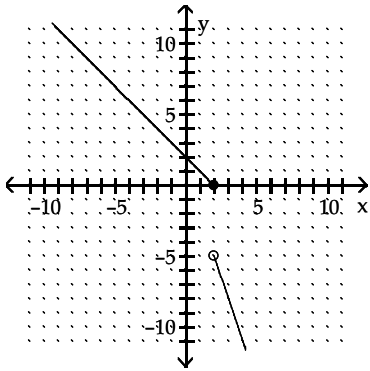
53)



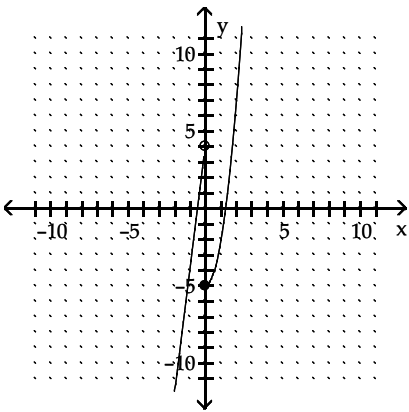
Answer Key

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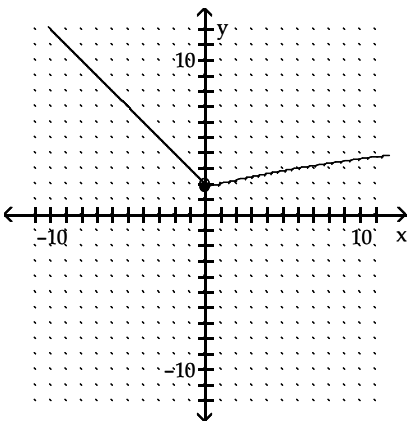
1)



2)



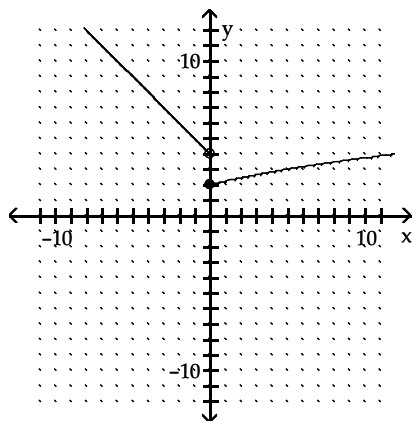
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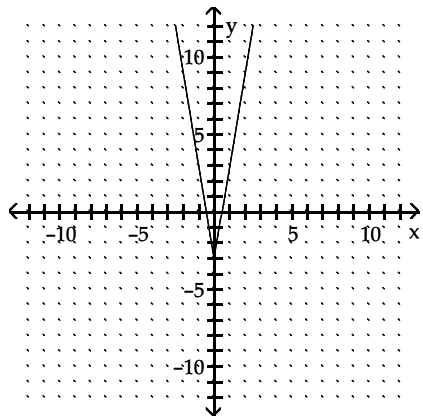
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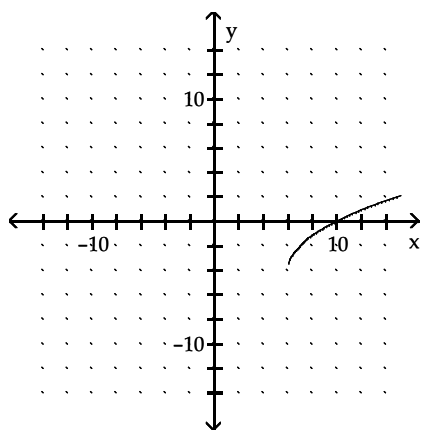
4)



5)



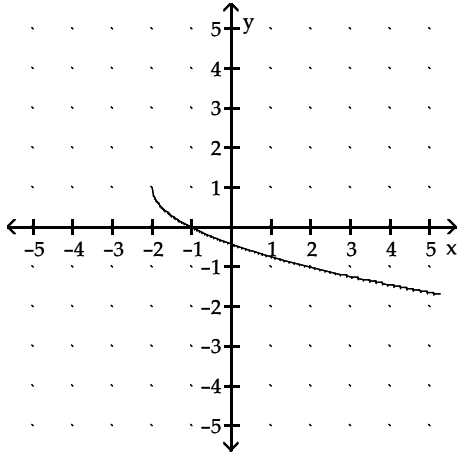
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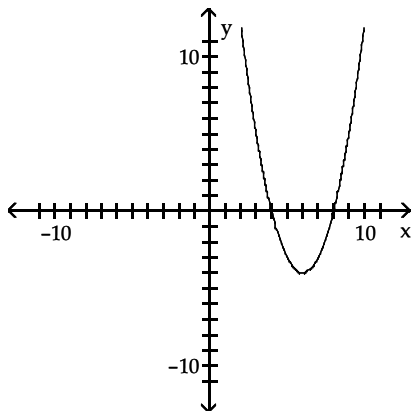
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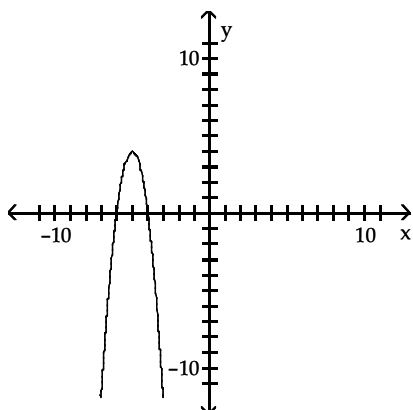
7)



8)



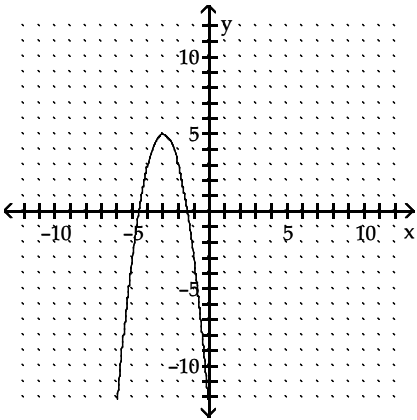
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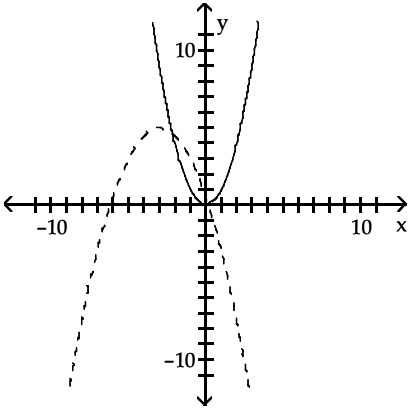
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10)



11)



12)  $(-3, -5)$

13)  $(5, 4)$

14)  $(9, 10)$

15) Domain:  $(-\infty, \infty)$ ; Range:  $(-\infty, -3]$

16) Domain:  $(-\infty, \infty)$ ; Range:  $[-1, \infty)$

17) Domain:  $(-\infty, \infty)$ ; Range:  $(-\infty, -4]$

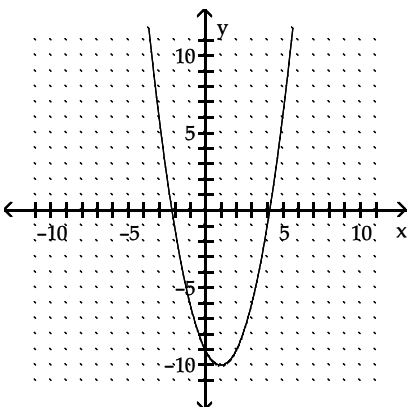
18) Increasing on  $(-\infty, 3)$ ; decreasing on  $(3, -\infty)$

19) Increasing on  $\left(-\infty, \frac{7}{2}\right)$ ; decreasing on  $\left(\frac{7}{2}, \infty\right)$

20) Increasing on  $(6, \infty)$ , decreasing on  $(-\infty, 6)$

21) Increasing on  $(-2, \infty)$ ; decreasing on  $(-\infty, -2)$

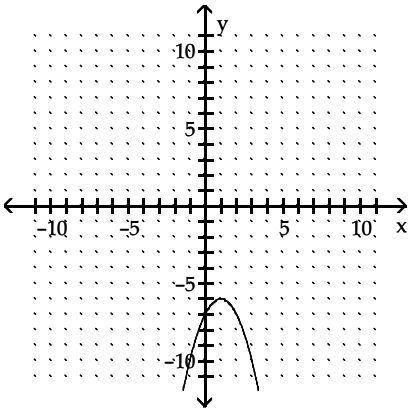
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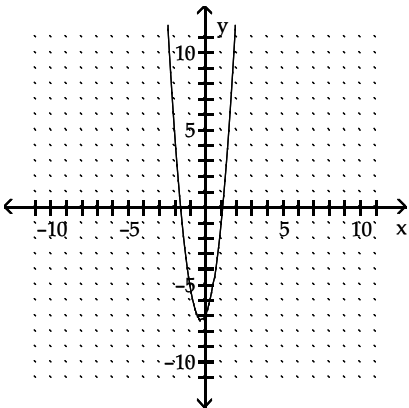
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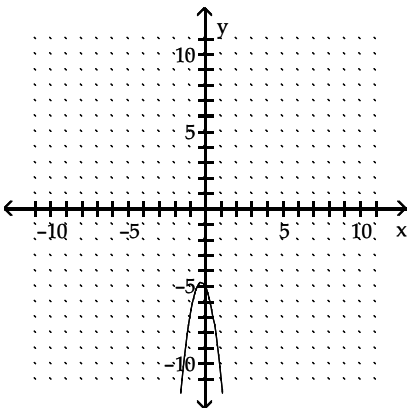
23)



24)



25)



26) 34 watches

27) \$107

28) 5.5 in.

29) 7.5 in.

30) 6

31) ↖ ↘

32) ↖ ↗

33) -9, multiplicity 1; 0, multiplicity 1;  $\frac{1}{2}$ , multiplicity 1; 5, multiplicity 1

34) -6, multiplicity 2; 6, multiplicity 3

35) Crosses at (2, 0) and (-6, 0)

36) Does not cross at (3, 0) or (-5, 0)

Answer Key

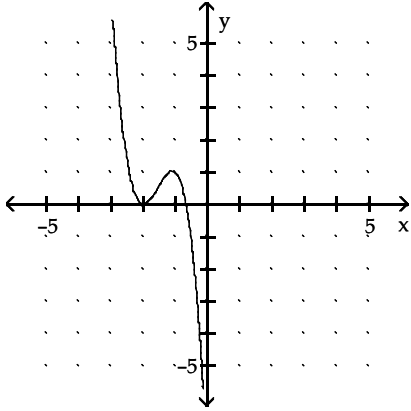
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37) Does not cross at  $(3, 0)$ , crosses at  $(-7, 0)$

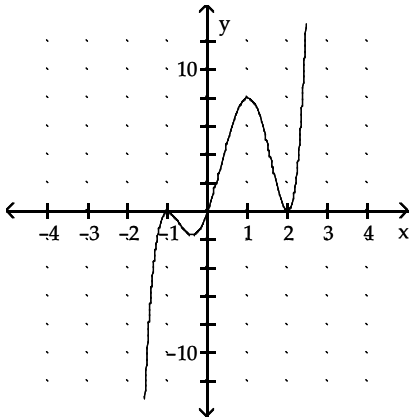
38) Does not cross at  $(1, 0)$  or  $(-6, 0)$

39) Does not cross at  $(3, 0)$ , crosses at  $(-6, 0)$

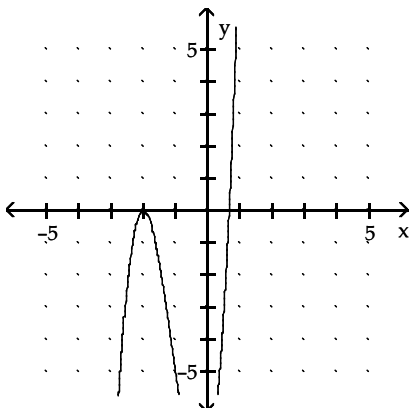
40)



41)



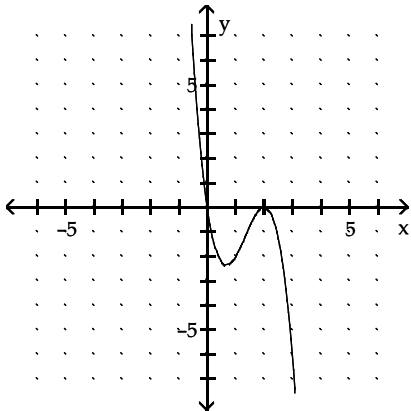
42)



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43)



44)  $x = 4, x = -8$

45)  $x = 1, x = -1$

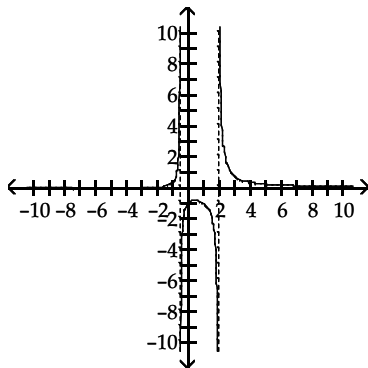
46)  $x = 4, x = -4$

47)  $y = 0$

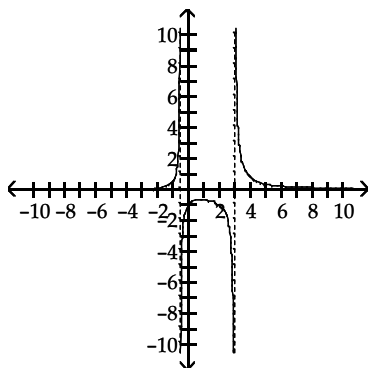
48)  $y = 7$

49)  $y = 1$

50) x-intercept:  $(-2, 0)$ , y-intercept:  $(0, -1)$ ;



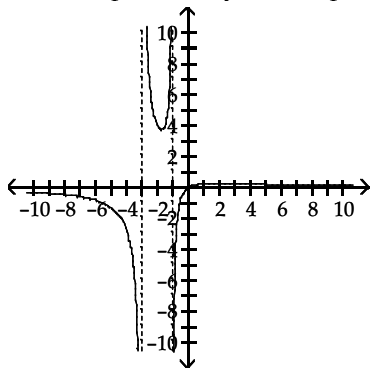
51) x-intercept:  $(-3, 0)$ , y-intercept:  $(0, -1)$ ;



# Answer Key

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52) x-intercept:  $(0, 0)$ , y-intercept:  $(0, 0)$ ;



53) x-intercept:  $(1, 0)$ , y-intercept:  $(0, \frac{1}{6})$ ;

