

Chapter 1

Which algebraic expression models the given word phrase?

- 5 times the sum of a and b
 - $5a + b$
 - $5(a + b)$
 - $a + b$
 - $5(a - b)$
- You had \$199, but you are spending \$3 each day. What algebraic expression models this situation?
 - $199 - 3d$
 - $199 + 3d$
 - $196d$
 - $3 + 199d$
- Tickets to a concert are available online for \$25 plus a one-time handling fee of \$1.75. The total cost is a function of the number of tickets bought. What function rule models the cost of the concert tickets? Evaluate the function for 6 tickets.

- $25t + 1.75$; \$151.75
- $1.75t + 25$; \$151.75
- $1.75t + 25$; \$35.50
- $25t + 1.75$; \$35.50

$$25t + 1.75$$

$$25(6) + 1.75$$

Evaluate the expression for the given value of the variable(s).

- $-x^2 - 4x - 4$; $x = -3$
 - 3
 - 1
 - 11
 - 17

Combine like terms. What is a simpler form of each expression?

$$5. -3(-4y + 3) + 7y$$

$$12y - 9 + 7y$$

$$19y - 9$$

Solve the equation.

$$6. -5y - 9 = -(y - 1)$$

$$-5y - 9 = -y + 1$$

$$-10 = 4y$$

$$y = \frac{-10}{4} = -\frac{5}{2} = -2.5$$

Solve the equation or formula for the indicated variable.

$$7. T = \frac{4U}{E}, \text{ for } U$$

$$\frac{TE}{4} = \frac{4U}{4}$$

$$U = \frac{TE}{4}$$

Solve the inequality. Graph the solution set.

8. $\frac{2k}{-2} \leq \frac{8}{-2}$
 $-2k \leq 6$ $k \geq -3$

Solve the problem by writing an inequality.

9. If the perimeter of a rectangular picture frame must be less than 200 in., and the width is 36 in., what must the height h of the frame be?
 $2l + 2w = P$
 $2l + 2(36) < 200$ $l < 64 \text{ in}$

Solve the compound inequality. Graph the solution.

10. $2x - 4 \geq -10$ and $2x - 4 < 10$
 $\frac{+4}{+4}$ $2x < 14$
 $2x \geq -6$
 $x \geq -3$ and $x < 7$

11. $4x - 5 < -17$ or $5x + 6 > 31$
 $\frac{+5}{+5}$ $5x > 25$
 $4x < -12$
 $x < -3$ or $x > 5$

Solve the absolute value equation.

12. $-2|4x - 5| - \frac{2}{2} = \frac{-4}{2}$
 $\frac{-2|4x - 5|}{-2} = \frac{-2}{-2}$
 $|4x - 5| = 1$

$4x - 5 = 1$ $4x - 5 = -1$
 $4x = 6$ $4x = 4$
 $x = \frac{3}{2}$ $x = 1$

Solve the inequality. Graph the solution.

13. $|2x + 3| \geq 19$

$2x + 3 \leq -19$ or $2x + 3 \geq 19$
 $\frac{-3}{-3}$ $\frac{-3}{-3}$
 $2x \leq -22$ $2x \geq 16$
 $x \leq -11$ or $x \geq 8$

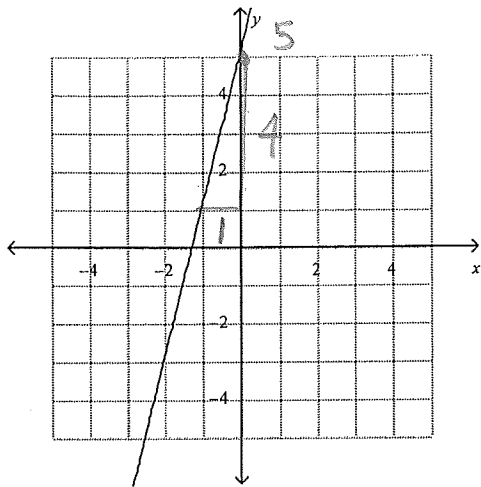
14. $|2x + 10| \leq 26$

$-26 \leq 2x + 10 \leq 26$
 $\frac{-10}{-10}$ $\frac{-10}{-10}$
 $-36 \leq 2x \leq 16$
 $\frac{-36}{2}$ $\frac{16}{2}$
 $-18 \leq x \leq 8$



Chapter 2

15. What is an equation of the line in slope intercept form?



$$y = 4x + 5$$

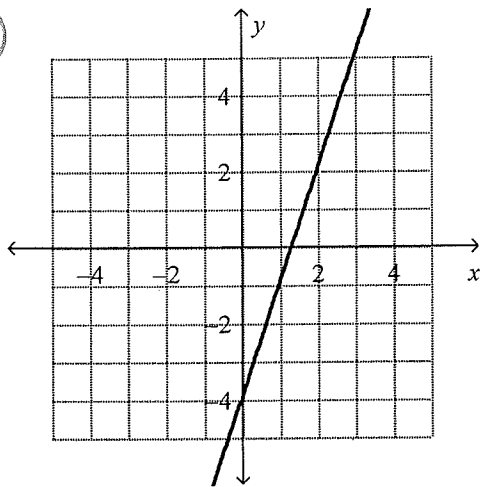
$$2x - 4 = 10$$

- a. $y = 5x + 4$
 b. $y = -5x + 4$

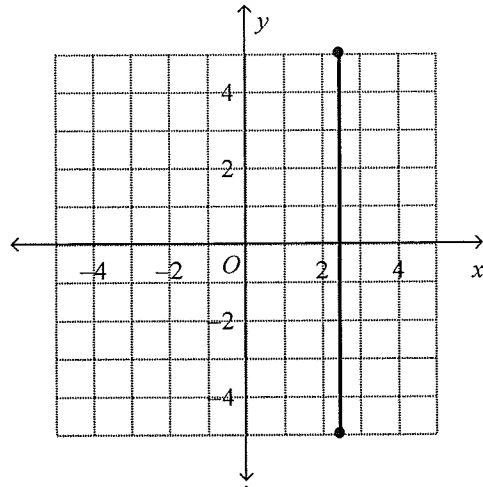
- c. $y = 4x - 5$
 d. $y = 4x + 5$

16. Use the vertical-line test to determine which graph represents a function.

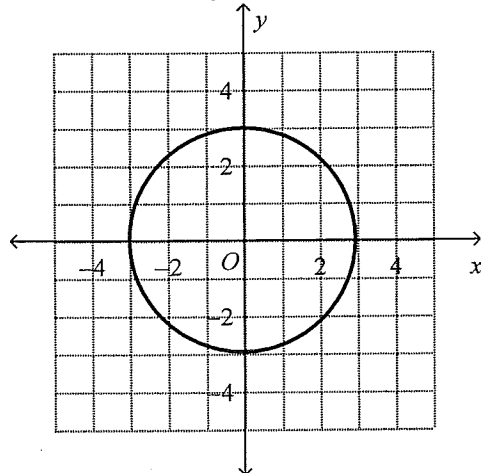
a.



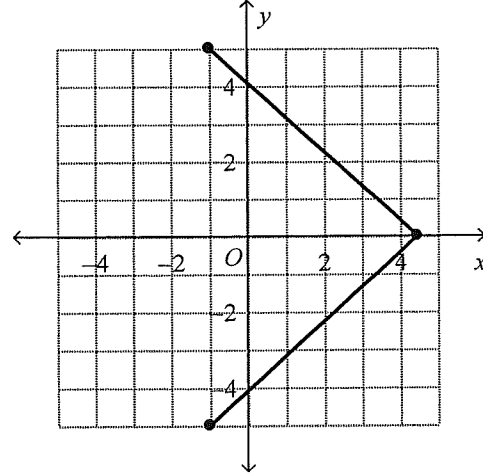
c.



b.



d.



Write the equation in slope-intercept form. What are the slope and y-intercept?

17. $-5x - 8y = 1$

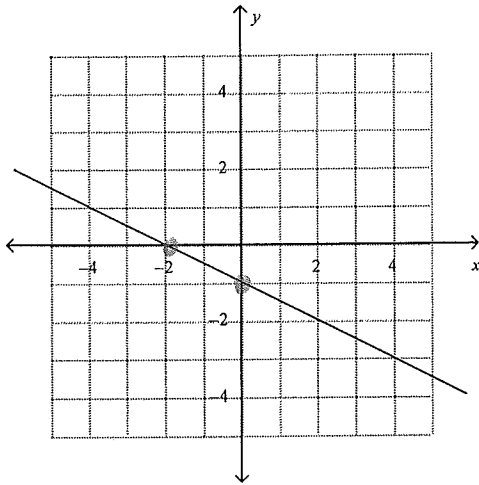
$$\frac{-8y}{-8} = \frac{5x+1}{-8}$$

$$y = -\frac{5}{8}x - \frac{1}{8}$$

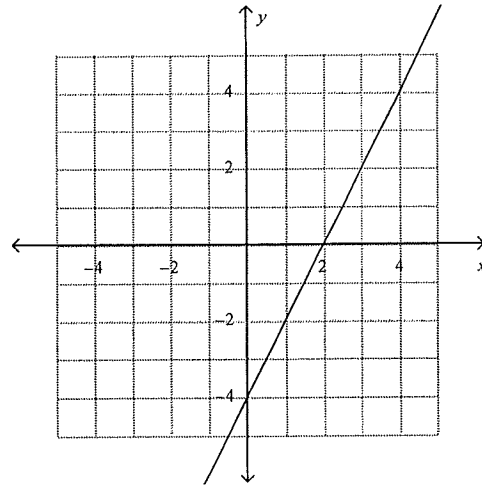
What is the graph of the equation?

18. $-2x - 4y = 4$

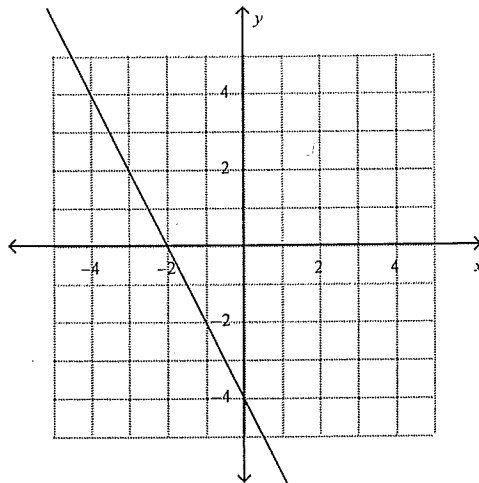
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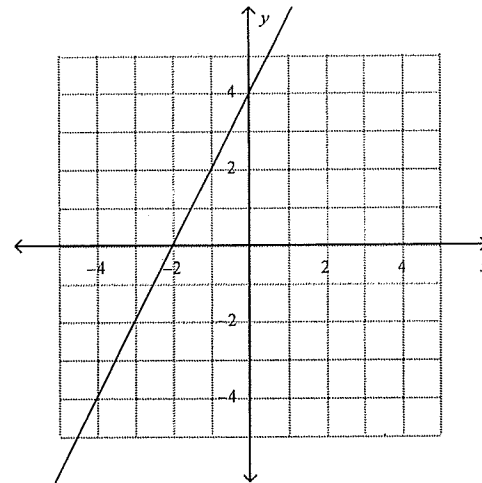
c.



b.



d.



19. Write the equation of the line, in standard form, that passes through the points $(-2, -7)$ and $(4, -10)$.

$$m = \frac{-7 + 10}{-2 - 4} = \frac{3}{-6} = -\frac{1}{2}$$

$$y + 10 = -\frac{1}{2}(x - 4)$$

$$y + 10 = -\frac{1}{2}x + 2$$

$$2 \cdot y = -\frac{1}{2}x - 8 \cdot 2$$

$$2y = -x - 16$$

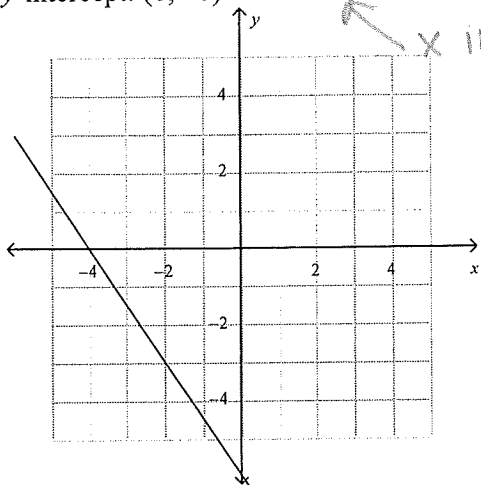
$$1x + 2y = -16$$

What are the intercepts of the equation? Graph the equation.

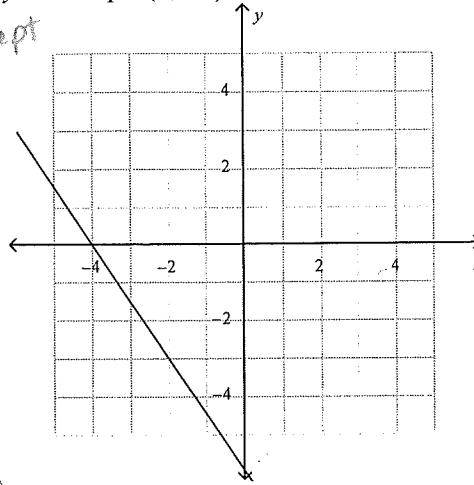
20. $-4x - 6y = 24$

$$\begin{array}{r|l} x & y \\ \hline 0 & -4 \leftarrow y \text{ int.} \\ -6 & 0 \leftarrow x \text{ intercept} \end{array}$$

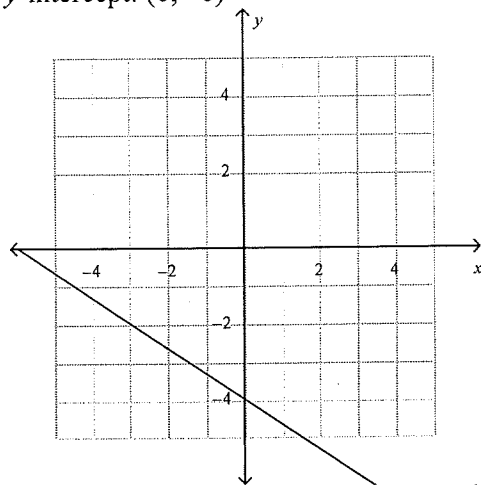
- a. x-intercept: $(-4, 0)$
y-intercept: $(0, -6)$



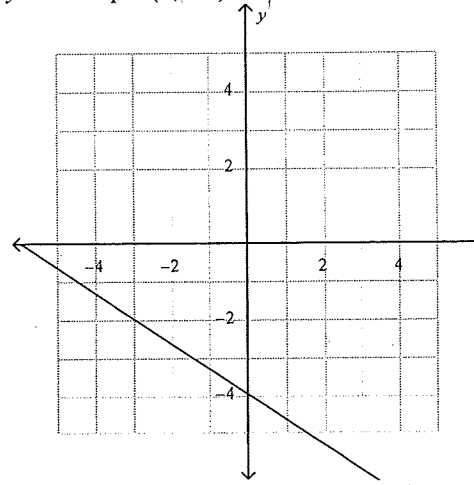
- c. x-intercept: $(-6, 0)$
y-intercept: $(0, -4)$



- b. x-intercept: $(-4, 0)$
y-intercept: $(0, -6)$



- d. x-intercept: $(-6, 0)$
y-intercept: $(0, -4)$



$$y - 5 = -\frac{1}{2}(x + 5) \quad | \quad y + 5 = -\frac{1}{2}(x - 15)$$

Write an equation of the line, in point-slope form, that passes through the two given points.

21. points: $(-5, 5)$, $(15, -5)$

$$m = \frac{5 - (-5)}{-5 - 15} = \frac{10}{-20} = -\frac{1}{2}$$

What is the equation of the line in slope-intercept form?

22. the line perpendicular to $y = \frac{1}{2}x + 3$ through $(3, 3)$

$$m = \frac{1}{2} \quad \cancel{m = -2}$$

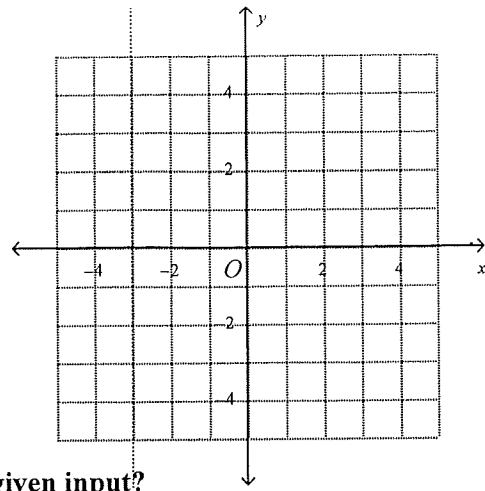
$$y - y_1 = m(x - x_1)$$

$$y - 3 = -2(x - 3)$$

$$y - 3 = -2x + 6$$

$$y = -2x + 9$$

23. Find the domain and range of the relation and determine whether it is a function.



For the function given, what is the output of the given input?

24. For $f(x) = -5x + 1$, find $f(3)$.

$$-5(3) + 1 = -14$$

What transformations change the graph of $f(x)$ to the graph of $g(x)$?

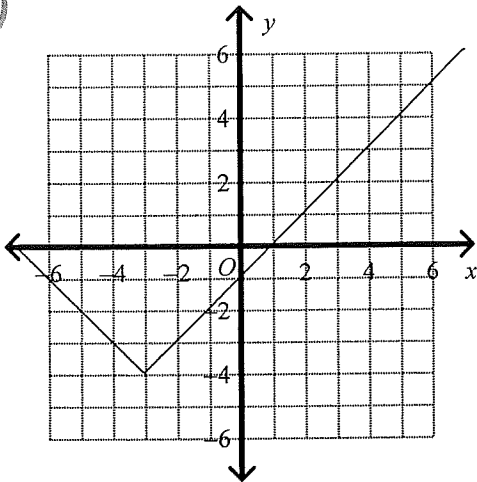
25. $f(x) = -7x^2$ $g(x) = -35x^2 + 5$

$$-7(5)x^2 + 5$$

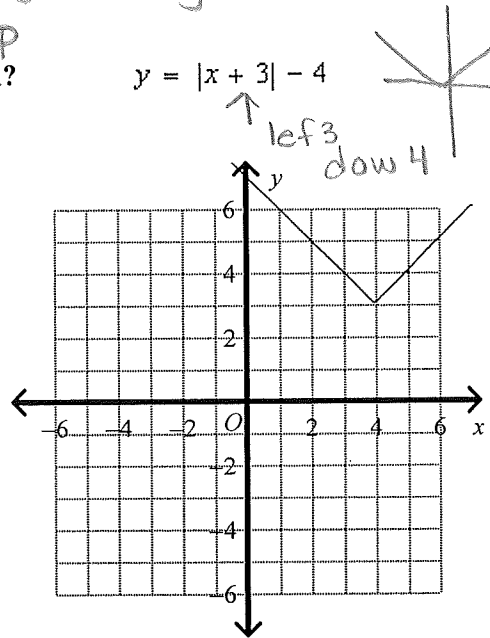
Vertical stretch by 5
5 up

26. What is the graph of the absolute value equation?

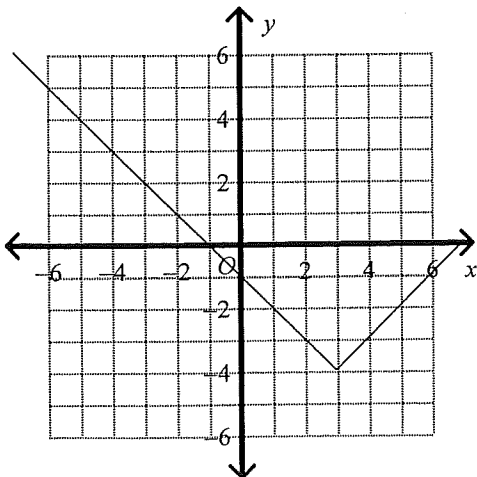
a.



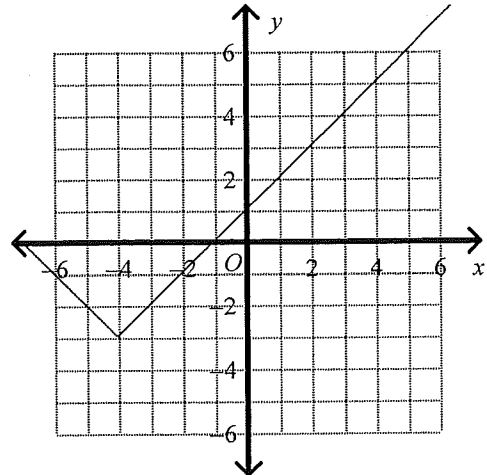
c.



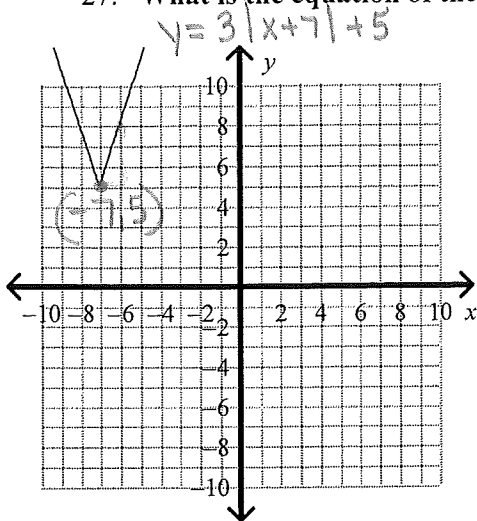
b.



d.



27. What is the equation of the absolute value function?



- a. $y = 3|-x - 7| + 5$
 b. $y = -3|x - 7| - 5$
 c. $y = -3|x + 7| - 5$
 d. $y = 3|x + 7| - 5$



28. Without graphing, identify the vertex, write the equation for the axis of symmetry, and find the x- and y- intercepts if any, of the graph of $y = -3|x - 4| + 9$

$-3|x - 4| + 9 = 0$
 $-3|x - 4| = -9$
 $\frac{-3}{-3} \frac{|x - 4|}{1} = \frac{-9}{-3}$
 $|x - 4| = 3$

vertex $(4, 9)$ AOS. $x = 4$
 x-int. $(7, 0)$ y-int. $(0, -3)$
 $(1, 0)$ $-12 + 9$

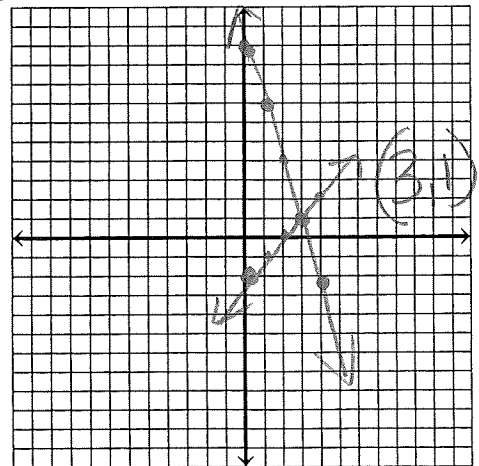
Chapter 3

Solve the system by graphing.

29. $\begin{cases} -3x - y = -10 \\ 4x - 4y = 8 \end{cases}$

$-3x - y = -10$
 $-\frac{y}{-1} = \frac{3x - 10}{-1}$
 $y = -3x + 10$

$4x - 4y = 8$
 $-\frac{4y - 4x + 8}{-4} = \frac{-4x + 8}{-4}$
 $y = x - 2$



Solve the system by substitution.

30. $\begin{cases} -2x - y = -14 \\ 3x - y = 11 \end{cases} \rightarrow$

$2x + y = 14$
 $3x - y = 11$

 $5x = 25$
 $x = 5$
 $y = 4$

Solve the system using elimination.

$$7(1) + 2y = 11 \\ 2y = 4 \\ y = 2$$

$$31. \begin{cases} 7(7x + 2y = 11) \\ 2(4x - 7y = -10) \end{cases} \Rightarrow \begin{array}{r} 49x + 14y = 77 \\ 8x - 14y = -20 \\ \hline 57x = 57 \\ x = 1 \end{array} \quad (1, 2)$$

$$32. \begin{cases} 4(3x + 3y = -15) \\ 3(2x - 4y = -16) \end{cases} \Rightarrow \begin{array}{r} 12x + 12y = -60 \\ 6x - 12y = -48 \\ \hline 18x = -108 \\ x = -6 \end{array} \quad y = 2$$

What are the solutions of the following systems?

$$33. \begin{cases} -x + 2y = 10 \\ -3x + 6y = 11 \end{cases} \Rightarrow \begin{array}{r} 3y - 6y = -30 \\ -2x + 4y = 11 \\ \hline 0 = -19 \end{array} \quad \begin{array}{l} \text{inconsistent} \\ \text{No Sol} \\ \text{independent} \end{array}$$

$$34. \begin{cases} x - 3y = 9 \\ -x + 3y = -9 \end{cases} \Rightarrow \begin{array}{r} 0 = 0 \end{array} \quad \begin{array}{l} \text{Consistent} \\ \text{infinite sol.} \\ \text{dependent} \end{array} \quad \{x: x - 3y = 9\}$$

35. A group of 52 people attended a ball game. There were three times as many children as adults in the group. Set up a system of equations that represents the numbers of adults and children who attended the game and solve the system to find the number of children who were in the group.

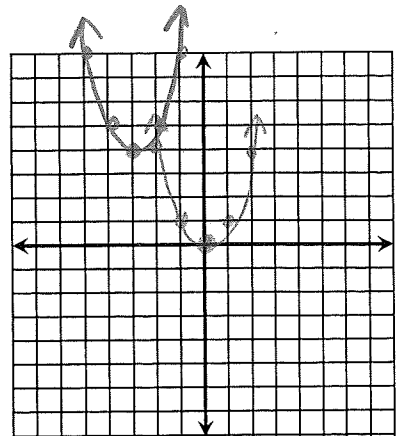
$$\begin{array}{l} a + c = 52 \\ c = 3a \\ \hline a + 3a = 52 \\ 4a = 52 \\ a = 13 \end{array} \quad \begin{array}{l} \text{children} = \\ c = 3a \\ \text{adults} \end{array} \quad c = 39$$

Chapter 4

Graph each function. How is each graph a translation of $f(x) = x^2$?

36. $y = (x+3)^2 + 4$
3 left
up 4

x	y
-2	4
-1	1
0	0
1	1
2	4

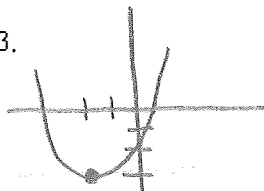


37. Identify the vertex and the axis of symmetry of the graph of the function $y = 2(x + 2)^2 - 4$.
 vertex $(-2, -4)$
 Aos. $x = -2$

$x = -2$
 $(-2, -4)$

38. Identify the maximum or minimum value and the domain and range of the graph of the function

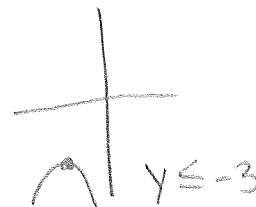
$y = 2(x + 2)^2 - 3$



max/min min

domain: all

range: $y \geq -3$



39. What steps transform the graph of $y = x^2$ to $y = -(x + 3)^2 + 5$?

left 3
 r.o. x axis
 up 5

40. Suppose a parabola has vertex $(-8, -7)$ and also passes through the point $(-7, -4)$. Write the equation of the parabola in vertex form.

$y = a(x - h)^2 + k$
 $-4 = a(-7 + 8)^2 - 7$
 $-4 = 1a - 7$
 $3 = a$

$y = 3(x + 8)^2 - 7$

What are the vertex and the axis of symmetry of the equation?

41. $y = 2x^2 + 4x - 10$

$x = \frac{-b}{2a}$

vertex $(-1, -12)$

Aos. $x = -1$



$\frac{-4}{2(2)} = -1$
 $2(-1)^2 + 4(-1) - 10$
 $2 - 4 - 10$

What is the maximum or minimum value of the function? What is the range?

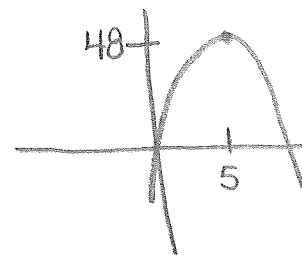
42. $y = -2x^2 + 20x - 2$

$x = \frac{-b}{2a} = \frac{-20}{2(-2)} = 5$

max/min $(5, 48)$

range: $y \leq 48$

$-2(5)^2 + 20(5) - 2$
 $-50 + 100 - 2$



What is the vertex form of the equation?

43. $y = x^2 + 8x - 6$

$y = x^2 + 8x + 16 - 6 - 16$
 $y = (x + 4)^2 - 22$

$x = \frac{-b}{2a} = -4$

$y = -22$

What is the expression in factored form?

44. $x^2 - 6x + 8$

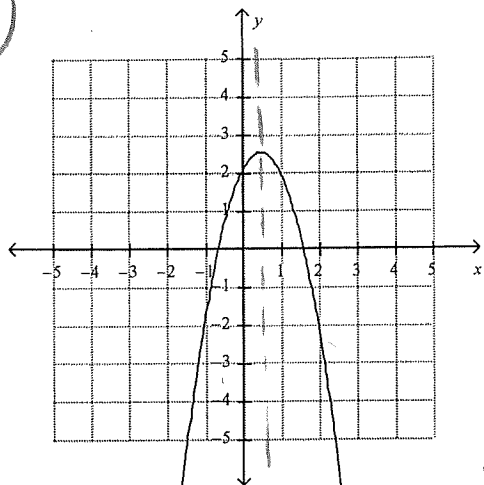
$(x - 4)(x - 2)$

What is the graph of the equation?

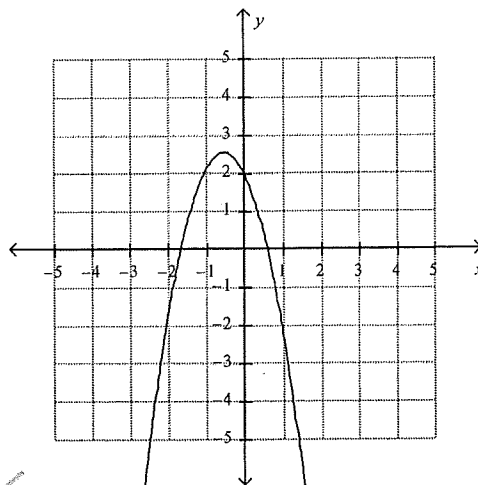
$$-\frac{b}{2a} = \frac{-2}{2(-2)} = \frac{-2}{-4} = \frac{1}{2}$$

45. $y = -2x^2 + 2x + 2$

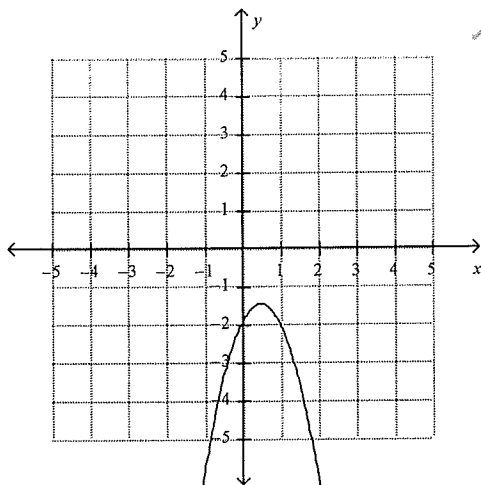
a.



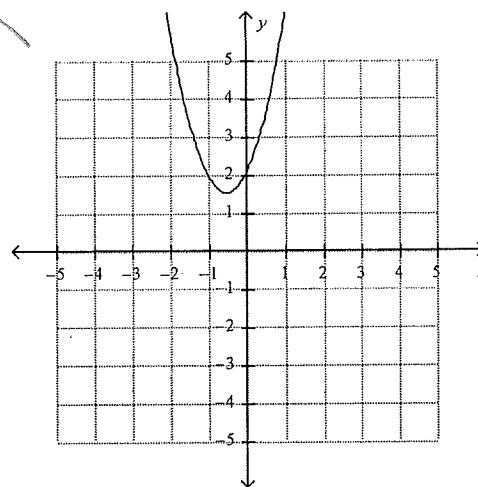
c.



~~b.~~



~~d.~~



What is the expression in factored form?

46. $-4x^2 + 16x + 48$

$$-4(x^2 - 4x - 12)$$

$$-4(x - 6)(x + 2)$$

47. $5x^2 - 22x - 15$

$$(5x + 3)(x - 5)$$

48. $9x^2 - 18x + 9$

$$9(x^2 - 2x + 1)$$

$$9(x - 1)(x - 1)$$

$$9(x - 1)^2$$

49. $16x^2 - 25$

$$(4x - 5)(4x + 5)$$

What are the solutions of the quadratic equation?

50. $x^2 + 11x = -28$

$x^2 + 11x + 28 = 0$
 $(x+7)(x+4) = 0$
 $x = -7$
 $x = -4$

51. $2x^2 + 5x - 3 = 0$

$(2x-1)(x+3) = 0$
 $x = 1/2$ $x = -3$

52. $6x^2 + 2x - 4 = 0$

$2(3x^2 + x - 2) = 0$
 $2(3x-2)(x+1) = 0$
 $x = 2/3$
 $x = -1$

What is the solution of each equation?

53. $\frac{108x^2}{108} = \frac{147}{108}$

$\sqrt{x^2} = \sqrt{49/36}$ $\pm \frac{7}{6}$

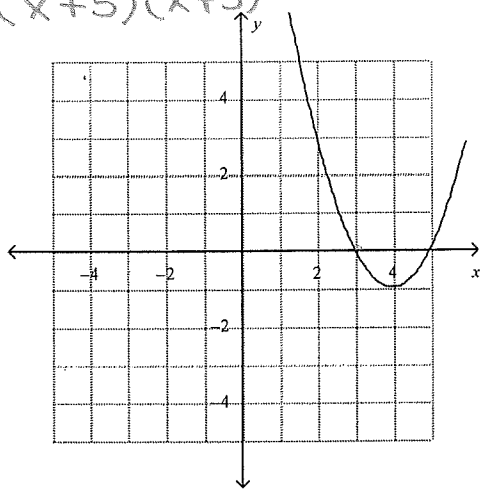
54. $x^2 + 18x + 81 = \frac{25}{-25 - 75}$

$x^2 + 18x + 56 = 0$
 $(x+4)(x+14) = 0$
 $x = -4$ $x = -14, 56$

Solve by graphing.

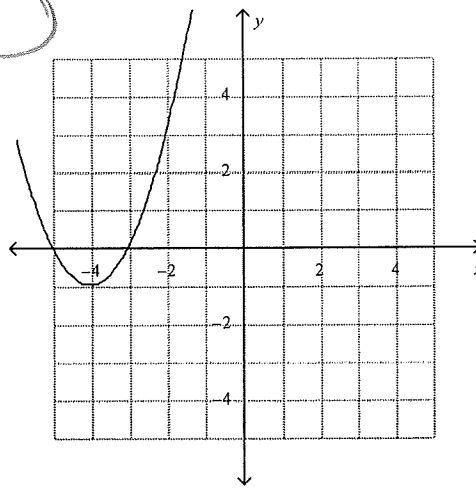
55. $x^2 + 8x + 15 = 0$

a. $(x+5)(x+3)$

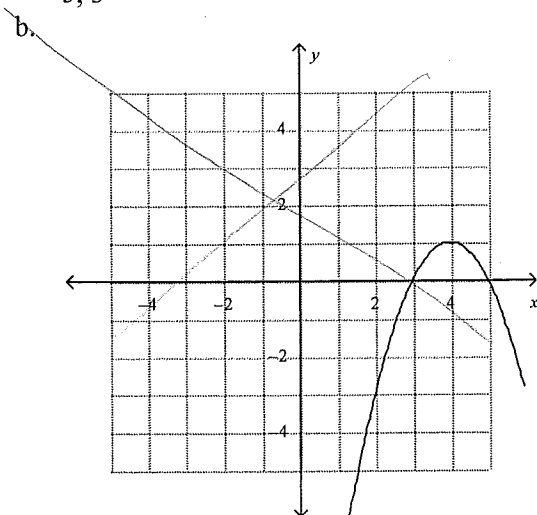


5, 3

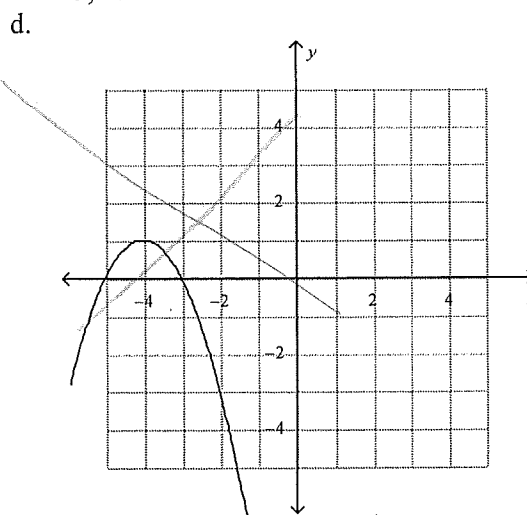
c.



-5, -3



5, 3



-5, -3

What value completes the square for the expression?

56. $x^2 - 18x + \underline{81}$

Solve the quadratic equation by completing the square.

57. $x^2 + 10x + 14 = 0$
 $x^2 + 10x + 25 = -14 + 25$
 $\sqrt{(x+5)^2} = \sqrt{11}$
 $x+5 = \pm\sqrt{11}$
 $x = -5 \pm \sqrt{11}$

Rewrite the equation in vertex form. Name the vertex and y-intercept.

58. $y = x^2 - 12x + 34$
 $y = x^2 - 12x + \underline{36} + 34 - \underline{36}$
 $y = (x-6)^2 - 2$

59. $y = x^2 - 10x + 17$
 $y = x^2 - 10x + \underline{25} + 17 - \underline{25}$
 $y = (x-5)^2 - 8$
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Use the Quadratic Formula to solve the equation.

60. $-4x^2 + x = -4$
 $x = \frac{-1 \pm \sqrt{1 - 4(-4)(4)}}{2(-4)}$
 $\frac{-1 \pm \sqrt{65}}{-8}$

61. $-2x^2 - 9x = 5$
 $\frac{9 \pm \sqrt{81 - 4(-2)(-5)}}{-4} = \frac{9 \pm \sqrt{81 - 40}}{-4} = \frac{9 \pm \sqrt{41}}{-4}$

What is the number of x-intercepts?

62. $x^2 - 7x + 7 = 0$
 $b^2 - 4ac$
 $7^2 - 4(1)(7)$
 $49 + 28 = 77$
 2 sol.

63. You live near a bridge that goes over a river. The underneath side of the bridge is an arch that can be modeled with the function $y = -0.000495x^2 + 0.619x$ where x and y are in feet. How high above the river is the bridge (the top of the arch)?

$x = \frac{-b}{2a} = \frac{-.619}{2(-.000495)} = .001$
 $(-.000495)(.001)^2 + .619(.001)$



Simplify the number using the imaginary unit i .

64. $\sqrt{-360}$
 $= i\sqrt{360}$
 $36 \cdot 10$
 $(6 \cdot 6) \cdot 25$
 $6i\sqrt{10}$

Simplify the expression.

65. $(2 - 5i) - (3 + 4i)$
 $2 - 5i - 3 - 4i$
 $-1 - 9i$

66. $\frac{(-1 + 3i)(4 + i)}{(4 - i)(4 + i)}$
 $\frac{-4 - i + 12i + 3i^2}{16 - i^2}$
 $\frac{-7 + 11i}{17}$

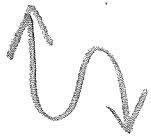
What are the solutions?

67. $9x^2 + 16 = 0$
 $\frac{9x^2}{9} = \frac{-16}{9}$
 $\sqrt{x^2} = \sqrt{\frac{-16}{9}}$
 $x = \pm \frac{4}{3}i$

68. $\frac{1}{2}x^2 - x + 2 = 0$
 $x^2 - 2x + 4 = 0$
 $x^2 - 2x + 1 = -4 + 1$
 $\sqrt{(x-1)^2} = \sqrt{-3}$
 $(x-1) = \pm \sqrt{3}i$
 $x = 1 \pm \sqrt{3}i$

Chapter 5

1. Write each polynomial in standard form, name it by degree and by the number of terms, describe the left- and right-end behavior, and state the maximum number of turning points, and state all of the possible number of turning points.



a. $y = 4(x^2 + 5x - 6) - 3(2x^3 + 4x - 5)$
 $4x^2 + 20x - 24 - 6x^3 - 12x + 15$
 SF $-6x^3 + 4x^2 + 8x - 9$

name Cubic polynomial w 4 terms
 end beh left ↑, right ↓
 max turns 2
 poss. turns 2

$10x^4 - 15x^3 + 20x^2 + 14x^2 - 16x$
 $y = 5x^2(2x^2 - 3x + 4) + 2x(7x - 8)$

SF $10x^4 - 15x^3 + 34x^2 - 16x$

name quartic polynomial w 4 terms
 end beh. ↑↑
 max turns 3
 poss. turns 3, 1

2. Use **common differences** to determine the degree of the polynomial represented by each data set.

a.

x	y
-1	16
0	2
1	-2
2	4
3	20
4	46

$\downarrow -14$
 $\downarrow -4$
 $\downarrow +6$
 $\downarrow +16$
 $\downarrow +26$
 $\downarrow +10$
 $\downarrow +10$
 $\downarrow +10$
 $\downarrow +10$

Quadratic

b.

x	y
-2	4
-1	-2
0	-1
1	1
2	-2
3	-16

$\downarrow -6$
 $\downarrow +1$
 $\downarrow +2$
 $\downarrow -3$
 $\downarrow -14$
 $\downarrow +7$
 $\downarrow +1$
 $\downarrow -5$
 $\downarrow -11$
 $\downarrow -6$
 $\downarrow -6$
 $\downarrow -11$

Cubic

3. **Factor** each polynomial and state the **zeros**. Describe the **multiplicity**.

a. $y = x^4 - 6x^3 + 9x^2$
 $= x^2(x^2 - 6x + 9)$
 $= x^2(x-3)^2$

0, 3
even, even

b. $y = 9x^5 + 3x^4 - 30x^3$
 $= 3x^3(3x^2 - x - 10)$
 $= 3x^3(3x+5)(x-2)$
 0, -5/3, 2 all odd

4. Write a polynomial that satisfies the given conditions. Write in **standard form**

a. Quintic X^5
 Zeros at 5, -4, and 0
 x = 0 has a multiplicity of 3.
 $y = x^3(x-5)(x+4)$

b. Cubic
 Zeros at 3, -2, and 1
 $(x-3)(x+2)(x-1)$

5. **Solve** each polynomial equation.

a. $x^3 + 8x^2 - 20x = 0$
 $x(x^2 + 8x - 20) = 0$
 $x(x+10)(x-2) = 0$
 $\downarrow \quad \downarrow \quad \downarrow$
 0 -10 2

c. $2x^3 + 4 = x^2 + 8x$
 $2x^3 - x^2 - 8x + 4 = 0$
 $x^2(2x-1) - 4(2x-1) = 0$
 $(2x-1)(x^2-4) = 0$
 $\downarrow \quad \pm 2$
 $\frac{1}{2} \quad \pm 2$

e. $x^4 = 36$
 $x^4 - 36 = 0$
 $(x^2 - 6)(x^2 + 6) = 0$
 $x = \pm\sqrt{6} \quad x = \pm i\sqrt{6}$

108
 \uparrow
 2 54
 \uparrow
 2 27
 \uparrow
 3 33

b. $27x^3 + 8 = 0$
 $3x \quad 3x \quad 3x \quad 222$
 $(3x+2)(9x^2 - 6x + 4) = 0$
 $x = -2/3$

d. $20x^3 + 7x^2 = 3x$
 $20x^3 + 7x^2 - 3x = 0$
 $x(20x^2 + 7x - 3) = 0$
 $x = 0$
 \downarrow
 $-7 \pm \sqrt{49 - 4(20)(-3)}$
 40
 $-7 \pm \sqrt{49 + 240}$
 40
 $-7 \pm \sqrt{289}$
 40
 -7 ± 17
 40
 $\frac{10}{40} = \frac{1}{4}$
 $\frac{-24}{40} = \frac{-6}{10}$
 $\frac{-3}{5}$

$6 \pm \sqrt{36 - 4(9)(4)}$
 18
 $6 \pm \sqrt{-108}$
 18
 $6 \pm 6i\sqrt{3}$
 18
 $\frac{6 \pm 6i\sqrt{3}}{3}$

6. Divide using long division. $(12x^3 - 10x^2 + 22x - 15) \div (3x^2 - x + 5)$

$4x - 2 \quad -5/3x^2 - x + 5$

$$\begin{array}{r} 3x^2 - x + 5 \overline{) 12x^3 - 10x^2 + 22x - 15} \\ \underline{-(12x^3 - 4x^2 + 20x)} \\ -6x^2 + 2x - 15 \\ \underline{-(-6x^2 + 2x - 10)} \\ -5 \end{array}$$

7. Divide using synthetic division. $(3x^3 - 14x^2 - 25) \div (x - 5)$

$$\begin{array}{r|rrrr} 5 & 3 & -14 & 0 & -25 \\ & & 15 & 5 & 25 \\ \hline & 3 & 1 & 5 & 0 \end{array}$$

$$\boxed{3x^2 + 1x + 5}$$

8. Use synthetic division to find $P(-4)$ for $P(x) = x^4 - 3x^3 + 5x^2 - 7x + 2$

$$\begin{array}{r} 13 \\ 33 \\ \hline 4 \\ 132 \\ \hline 556 \end{array}$$

$$\begin{array}{r|rrrrrr} -4 & 1 & -3 & 5 & -7 & 2 \\ & & -4 & 28 & -132 & 556 \\ \hline & 1 & -7 & 33 & -139 & 558 \end{array}$$

558

9. Use the Rational Root Theorem to list all possible roots of the polynomial equation.

$$4x^3 + 2x - 12 = 0$$

$$\frac{\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12}{\pm 1, \pm 2, \pm 4}$$

10. Find all the roots for the following polynomials.

a. $P(x) = x^3 + 3x^2 + 6x + 4$

$$\begin{array}{r|rrrr} -1 & 1 & 3 & 6 & 4 \\ & & -1 & -2 & -4 \\ \hline & 1 & 2 & 4 & 0 \end{array}$$

$$(x+1)(x^2 + 2x + 4)$$

$$\boxed{-1, -1 \pm \sqrt{3}i}$$

$$x^2 + 2x + 4 = 0$$

$$x^2 + 2x + 1 = -4 + 1$$

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

$$x+1 = \pm \sqrt{3}i$$

$$x = \boxed{-1 \pm \sqrt{3}i}$$

b. $P(x) = 8x^3 + 2x^2 - 5x + 1$

$$\begin{array}{r|rrrr} -1 & 8 & 2 & -5 & 1 \\ & & -8 & 6 & -1 \\ \hline & 8 & -6 & 1 & 0 \end{array}$$

$$\boxed{x = -1}$$

$$8x^2 - 6x + 1$$

$$\frac{6 \pm \sqrt{36 - 4(8)(1)}}{16} = \frac{6 \pm \sqrt{36 - 32}}{16} = \frac{6 \pm \sqrt{4}}{16} = \frac{6 \pm 2}{16}$$

$$\boxed{\frac{1}{2}, \frac{1}{4}}$$

11. A polynomial function with rational coefficients has roots of $4 + \sqrt{7}$ and $6i$. Find two additional roots.

$$4 - \sqrt{7}, -6i$$

12. Write a polynomial function with rational coefficients so that $P(x) = 0$ has the given roots.

a. -4 , and $2i$

$$(x+4)(x-2i)(x+2i)$$

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

$$\begin{array}{l} (x-2i)(x+2i) \\ x^2 - (4i)^2 \\ (x^2+4) \end{array}$$

b. $\sqrt{5}$, and $-3i$

$$(x-\sqrt{5})(x+\sqrt{5})(x-3i)(x+3i)$$

$$(x^2+5)(x^2+9)$$

$$\begin{array}{l} (x^2+5)(x^2+9) \\ x^4 + 9x^2 + 5x^2 + 45 \\ x^4 + 14x^2 + 45 \end{array}$$

13. Find all the complex roots of each equation.

a. $y = 2x^4 + 3x^3 - 17x^2 - 27x - 9$

$$\begin{array}{r|rrrrr} -3 & 2 & 3 & -17 & -27 & -9 \\ & & -6 & 9 & 24 & 9 \\ \hline & 2 & -3 & -8 & -3 & 0 \end{array}$$

$$2x^2 + 3x + 1$$

$$x = \frac{-3 \pm \sqrt{9 - 4(2)(1)}}{4}$$

$$\frac{-3 \pm \sqrt{1}}{4} = \frac{-3 \pm 1}{4} = \left(\frac{-1}{2} \right), (-1)$$

b. $y = x^3 - 4x^2 + 4x - 3$

$$\begin{array}{r|rrrr} 3 & 1 & -4 & 4 & -3 \\ & & 3 & -3 & 3 \\ \hline & 1 & -1 & 1 & 0 \end{array}$$

$$3, \frac{1 \pm \sqrt{3}i}{2}$$

$$x^2 - 1x + 1 = 0$$

$$\frac{1 \pm \sqrt{1 - 4(1)(1)}}{2} = \frac{1 \pm \sqrt{3}i}{2}$$

$$\begin{array}{r|rrrr} 3 & 2 & -3 & -8 & -3 \\ & & 6 & 9 & 3 \\ \hline & 2 & 3 & 1 & 0 \end{array}$$

14. For the given equation, state the number of complex roots, the possible number of real roots, and the possible rational roots.

$$y = 2x^4 + 3x^3 - 17x^2 - 27x - 9$$

complex roots _____

poss. # real roots _____

poss. rational roots _____

Sections 6.1 and 6.2

1. Find ALL the real square roots of each number.

a. $\pm .1$

2. Find ALL the real cube roots of each number.

a. -7

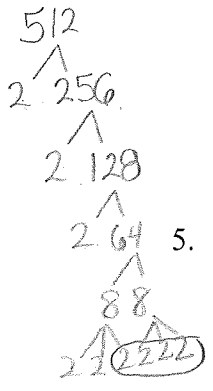
3. Find ALL the real fourth roots of each number.

a. No sol.

4. Simplify each radical expression.

a. $\sqrt[4]{512x^7y^9}$ $4xy^2 \sqrt[4]{2x^3y}$ b. $\sqrt[3]{\frac{64x^9}{343}}$ $\frac{4x^3}{7}$

$$(2 \cdot 2 \cdot 2 \cdot 2) (2 \cdot 2 \cdot 2 \cdot 2) 2$$



5. Multiply, and then simplify.

a. $\sqrt{3x} \cdot \sqrt{6x^3}$ $\sqrt{3x} \cdot \sqrt{2 \cdot 3x^3}$ $(3x^2 \sqrt{2})$ b. $\sqrt[3]{50x^2z^5} \cdot \sqrt[3]{15y^3z}$ $2 \cdot 5 \cdot 5 \cdot 3 \cdot 5$ $5z^2y \sqrt[3]{x^2}$

$$\sqrt{3x} \cdot \sqrt{2 \cdot 3x^3}$$

$$5yz^2 \sqrt[3]{x^2}$$

6. Simplify each expression. Rationalize denominators when necessary.

<p>a. $\frac{\sqrt{2y}}{\sqrt{8x^3}} \cdot \frac{\sqrt{y}}{\sqrt{4x^3}} = \frac{\sqrt{y} \sqrt{x}}{2x\sqrt{x} \sqrt{x}} \cdot \frac{\sqrt{xy}}{2x^2}$</p>	<p>b. $\sqrt[3]{\frac{625x^{12}y^{16}}{5x^2y^4}}$ $\sqrt[3]{\frac{125x^{10}y^{12}}{5x^3y^4}} = 5x^3y^4 \sqrt[3]{x}$</p>
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Sections 6.3

7. Simplify, if possible.

<p>a. $14x\sqrt{2} - 8x\sqrt{2}$ $6x\sqrt{2}$</p>	<p>b. $2\sqrt{128} - \sqrt{50} + 3\sqrt{72}$ $16\sqrt{2} - 5\sqrt{2} + 18\sqrt{2}$ $29\sqrt{2}$</p>
---	--

128
 \swarrow
 $2 \overline{) 64}$
 \swarrow
 $8 \overline{) 88}$
 $\overline{) 222} \overline{) 222}$
 50
 \swarrow
 $2 \overline{) 25}$

8. Multiply each pair of radical binomials.

<p>a. $(4 - \sqrt{5})(4 + \sqrt{5})$ $16 - 5$ 11</p>	<p>b. $(4 + \sqrt{6})(7 - 2\sqrt{6})$ $28 - 8\sqrt{6} + 7\sqrt{6} - 12$ $16 - \sqrt{6}$</p>
<p>c. $(2 - \sqrt{7})^2$ $(2 - \sqrt{7})(2 - \sqrt{7})$ $4 - 4\sqrt{7} + 7$ $11 - 4\sqrt{7}$</p>	<p style="text-align: right;">$3\sqrt{2} \cdot 3\sqrt{2}$</p>

9. Rationalize each denominator.

<p>a. $\frac{(7 + \sqrt{3})(5 + \sqrt{3})}{(5 - \sqrt{3})(5 + \sqrt{3})}$ $\frac{35 + 7\sqrt{3} + 5\sqrt{3} + 3}{25 + 5\sqrt{3} - 5\sqrt{3} - 3}$ $\frac{38 + 12\sqrt{3}}{22}$ $\frac{19 + 6\sqrt{3}}{11}$</p>	<p>b. $\frac{(4 - 3\sqrt{2})(6 - 3\sqrt{2})}{(6 + 3\sqrt{2})(6 - 3\sqrt{2})}$ $\frac{24 - 12\sqrt{2} - 18\sqrt{2} + 18}{36 - 18}$ $\frac{42 - 30\sqrt{2}}{18}$ (reduce by 2) $\frac{21 - 15\sqrt{2}}{9}$ reduce by 3 $\frac{7 - 5\sqrt{2}}{3}$</p>
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Section 6.4

10. Write each expression in simplest, radical form. Your answers should have **no negative or fractional exponents**, and **no radicals in the denominator**.

<p>a. $(27x^{-3}y^9)^{\frac{1}{3}}$</p> <p>$27^{\frac{1}{3}} x^{-1} y^3$</p> <p>$\frac{3y^3}{x}$</p>	<p>b. $(4x^{\frac{3}{4}})(6x^{\frac{1}{3}})$</p> <p>$24x^{13/12}$</p> <p>$\frac{3}{4} + \frac{1}{3} = \frac{9}{12} + \frac{4}{12}$</p>
<p>c. $(x^{\frac{1}{4}})^{-8}$</p> <p>$x^{-2} = \frac{1}{x^2}$</p>	<p>d. $(\frac{x^{\frac{2}{3}}}{x^{\frac{4}{3}}})^{-9}$</p> <p>$\frac{x^{-6}}{x^{-12}} = \frac{x^{12}}{x^6}$</p> <p>$\frac{4}{3} \cdot -9 = -12$</p> <p>$x^6$</p>

Sections 6.5

11. Solve each equation. Be sure to check for extraneous solutions.

<p>a. $4(x-2)^{\frac{1}{3}} - 15 = 5$</p> <p>$4(x-2)^{\frac{1}{3}} = 20$</p> <p>$(x-2)^{\frac{1}{3}} = 5$</p> <p>$x-2 = 125$</p> <p>$x = 127$</p>	<p>b. $\sqrt{3x+4} - 2 = 8$</p> <p>$(\sqrt{3x+4})^2 = (10)^2$</p> <p>$3x+4 = 100$</p> <p>$3x = 96$</p> <p>$x = 32$</p>
<p>c. $2(x-1)^{\frac{2}{3}} = 18$</p> <p>$(x-1)^{\frac{2}{3}} = 9$</p> <p>$\sqrt{(x-1)^2} = \sqrt{729}$</p> <p>$x-1 = \pm 27$</p> <p>$x = 1+27 = 28$</p> <p>$x = 1-27 = -26$</p>	<p>d. $(\sqrt{x+2})(x-6)^2$</p> <p>$(x+2) = x^2 - 12x + 36$</p> <p>$-x - 2 \quad -x - 2$</p> <p>$0 = x^2 - 13x + 34$</p> <p>you have to use the quadratic formula</p>

$x^2 - 13x + 34$
 $(x-9)(x-4)$
 $x=9 \quad x=4$

Section 6.6

12. Let $f(x) = 5x^2 - 17x - 12$ and $g(x) = 10x + 6$. Perform each function operation and then find the domain.

a. $(f+g)(x)$
 $5x^2 - 7x - 6$
 d: arn

b. $(g-f)(x)$
 $(10x+6) - (5x^2-17x-12)$
 $-5x^2 + 27x + 18$
 d: arn

c. $(f \cdot g)(x)$
 $(5x^2 - 17x - 12)(10x + 6)$
 $50x^3 + 30x^2 - 170x - 102x - 120x - 72$
 $50x^3 - 72x - 290x - 72$
 d: arn

d. $\left(\frac{f}{g}\right)(x)$
 $\frac{5x^2 - 17x - 12}{10x + 6}$
 $\frac{(5x+3)(x-4)}{2(5x+3)}$
 $\frac{x-4}{2}$
 d: arn
 $x \neq -6/10$
 or $-3/5$

13. Let $f(x) = 2x^2 - 3$ and $g(x) = 2x - 7$. Find each composition.


a. $(g \circ f)(-4)$
 $2(-4)^2 - 3$
 $32 - 3$
 $g(29)$
 $2(29) - 7$
 $58 - 7 = 51$

b. $(f \circ g)(x)$
 $2(2x-7)^2 - 3$
 $2(4x^2 - 28x + 49) - 3$
 $8x^2 - 56x + 98 - 3$
 $8x^2 - 56x + 95$


Section 6.7-6.8

14. Find the inverse of each function. State whether the inverse is also a function. State the domain and range of the function and its inverse.

$\sqrt{x} = \sqrt{(y-3)^2}$
 $\pm\sqrt{x} = y-3$

a. $y = \sqrt{x-5}$

 $x = \sqrt{y-5}$
 $x^2 = y-5$
 $x^2 + 5 = y$

inv: $f^{-1}(x) = x^2 + 5$
 function:
 D: $x \geq 5$
 R: $y \geq 0$
 inverse:
 D: $x \geq 0$
 R: $y \geq 5$

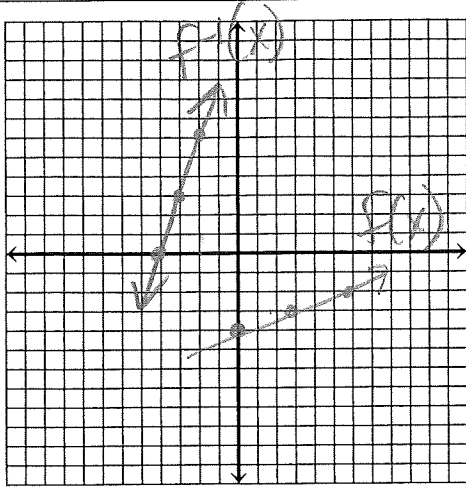
b. $y = (x-3)^2$

 inv: $y = \pm\sqrt{x} + 3$
 function:
 D: X arn
 R: $y \geq 0$
 inverse:
 D: $x \geq 0$
 R: arn

15. Graph both the original function and the inverse on the same grid. State whether the inverse is also a function.

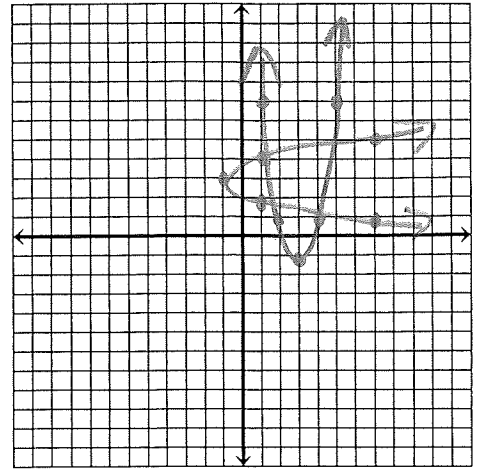
a. $y = \frac{1}{3}x - 4$ inv function: y or n

b. $y = 2(x-3)^2 - 1$ inv function: y or n

x	y
0	-4
3	-3
6	-2



x	y
1	7
2	1
3	-1
4	1
5	7

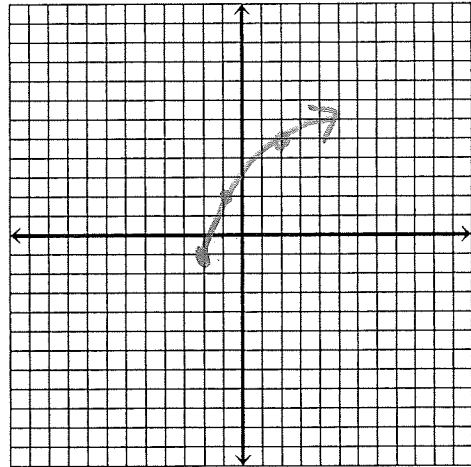
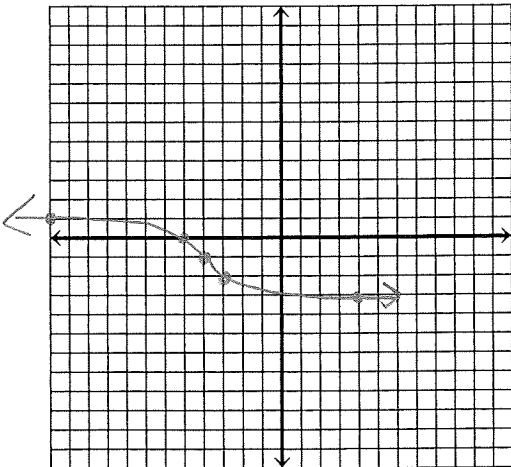


16. Graph each function using transformations. Label your graphs.

a. $y = -\sqrt[3]{x+4} - 1$

b. $y = 3\sqrt{x+2} - 1$

x	y
-8	-2
-1	-1
0	0
1	1
8	2



subtract 2
 \downarrow
 $x \mid y \leftarrow 3y$

0	0
1	1
4	2

 $\leftarrow -1$

x	y	x	y
-2	0	-2	-1
-1	3	-1	2
2	6	2	5

17. Rewrite each function so that it would be easier to name the transformations. Describe the transformations.

a. $y = \sqrt{4x+16} - 2$

b. $y = -\sqrt[3]{125x-250}$

x	y
0	0
1	1
4	2

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

$y = -\sqrt[3]{125(x-2)}$
 $y = -5\sqrt[3]{x-2}$

x	y
-8	-2
-1	-1
0	0
1	1
8	2