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CP Algebra II Midterm Review Packet 2018-2019

Unit 1: Linear Equations and Inequalities

Solve each equation.

1. $\left[\frac{2}{3}x = \frac{3}{5}\right] 15$

$$\begin{array}{r} 10x = 9 \\ \hline 10 \quad 10 \\ x = \frac{9}{10} \end{array}$$

4. $3(k-2) = k+4$

$$\begin{array}{r} 3k - 6 = k + 4 \\ -k \quad -k \\ \hline 2k - 6 = 4 \\ +6 \quad +6 \\ \hline 2k = 10 \\ \frac{2k}{2} = \frac{10}{2} \\ k = 5 \end{array}$$

6. $V = \frac{h}{lw}$ for h

$$h = \frac{V}{lw}$$

2. $3x - 4(x+5) = 6x + 22$

$$\begin{array}{r} 3x - 4x - 20 = 6x + 22 \\ -x - 20 = 6x + 22 \\ +20 \quad +20 \\ \hline -x = 6x + 42 \\ -6x \quad -6x \\ \hline -7x = 42 \end{array}$$

$$\begin{array}{r} -7x = 42 \\ \frac{-7x}{-7} = \frac{42}{-7} \\ x = -6 \end{array}$$

5. $\frac{x+4}{3} = \frac{x}{6}$

$$\begin{array}{r} 6(x+4) = 3x \\ 6x + 24 = 3x \\ -6x \quad -6x \\ \hline 24 = -3x \\ \frac{24}{-3} = \frac{-3x}{-3} \end{array}$$

7. $\frac{x+y}{z} = b$ for x

$$\begin{array}{r} x + y = bz \\ -y \quad -y \\ \hline x = bz - y \end{array}$$

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

$$\begin{array}{r} 8x - 3 = 10x + 5 \\ -8x \quad -8x \\ \hline -3 = 2x + 5 \\ -5 \quad -5 \\ \hline -8 = 2x \\ \frac{-8}{2} = \frac{2x}{2} \\ -4 = x \end{array}$$

Find the slope of the line that passes through each pair of points.

8. $(-6, -5), (4, 1)$

$$m = \frac{1 + 5}{4 + 6} = \frac{6}{10} = \frac{3}{5}$$

9. $(4, 1.5), (4, 6.5)$

$$m = \frac{6.5 - 1.5}{4 - 4} = \frac{5}{0} \text{ undefined}$$

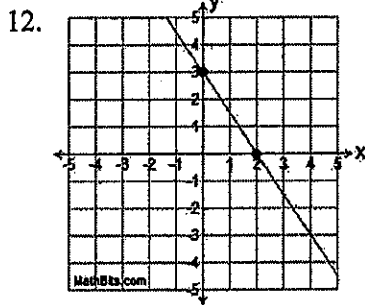
10. $(6, 8), (-4, 8)$

$$m = \frac{8 - 8}{-4 - 6} = \frac{0}{-10} = 0$$

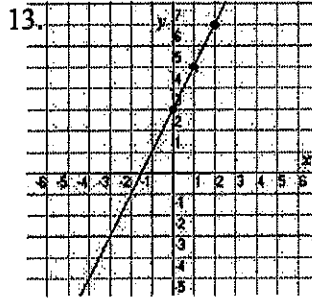
11. $(-3, -10), (-2, -4)$

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

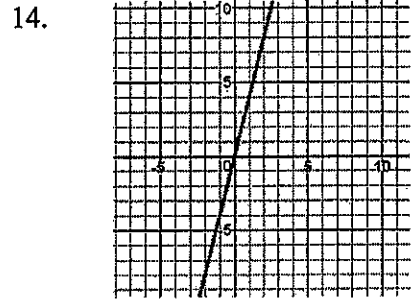
Find the slope of the line.



$$m = -\frac{3}{2}$$

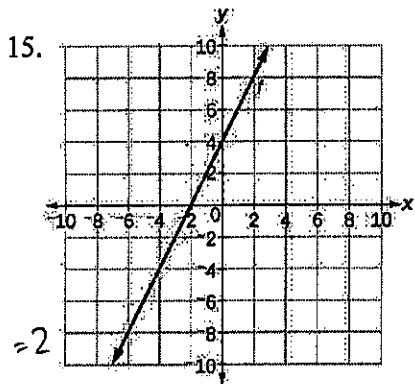


$$m = \frac{2}{1} = 2$$



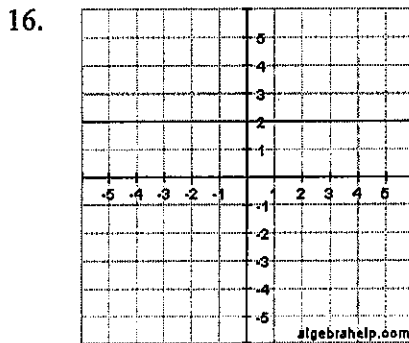
$$m = \frac{4}{1} = 4$$

Write the equation in slope-intercept form for each graph.

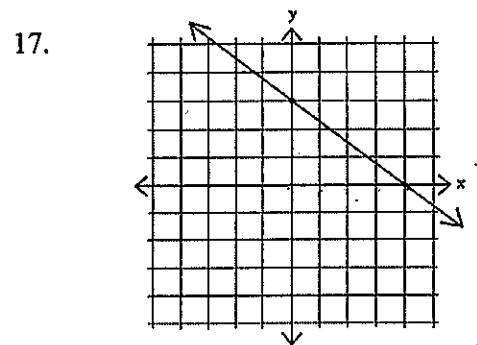


$$m = \frac{4}{2} = 2$$

$$y = 2x + 4$$



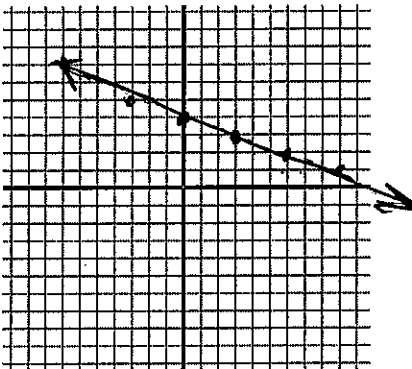
$$y = 2$$



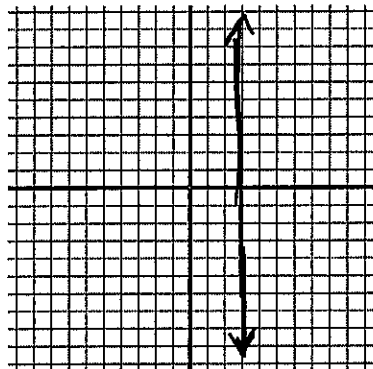
$$y = -\frac{3}{4}x + 3$$

Graph each line.

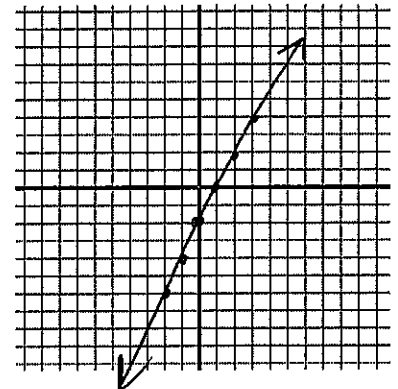
18. $y = -\frac{1}{3}x + 4$



19. $x = 3$



20. $2y - 4x = -4$
 $\quad \quad \quad +4x \quad +4x$
 $\frac{2y}{2} = \frac{4x - 4}{2}$
 $y = 2x - 2$



Find the x- and y-intercepts.

21. $2x + 5y = 10$

$\text{let } x=0 \quad \text{let } y=0$
 $\frac{5y}{5} = \frac{10}{5} \quad \frac{2x}{2} = \frac{10}{2}$
 $y=2 \quad x=5$
 $y\text{-int: } (0, 2) \quad x\text{-int: } (5, 0)$

22. $3x - 4y - 12 = 0$

$3x - 4y = 12$
 $\text{let } x=0 \quad \text{let } y=0$
 $\frac{-4y}{-4} = \frac{12}{-4} \quad \frac{3x}{3} = \frac{12}{3}$
 $y = -3 \quad x = 4$
 $y\text{-int: } (0, -3) \quad x\text{-int: } (4, 0)$

Find the slope of the line parallel to the given line.

23. a. $y = -\frac{1}{3}x + 27$

$\parallel m = -\frac{1}{3}$

b. $6x - 3y = 18$

$-6x \quad -6x$
 $\frac{-3y}{-3} = \frac{-6x + 18}{-3}$
 $y = 2x - 6$
 $\parallel m = 2$

Find the slope of the line perpendicular to the given line.

24. a. $y = 2x + 18$

$\perp m = -\frac{1}{2}$

b. $x + 4y = 16$

$-\frac{x}{4} \quad \frac{x}{4}$
 $\frac{4y}{4} = \frac{-x + 16}{4}$
 $y = -\frac{1}{4}x + 4 \quad \perp m = 4$

State the slope and y-intercept of the graph of each equation.

25. $3x + 5y = 20$

$-\frac{3x}{5} \quad -\frac{3x}{5}$
 $\frac{5y}{5} = \frac{-3x + 20}{5}$
 $y = -\frac{3}{5}x + 4$

$m = -\frac{3}{5} \quad b = 4$

26. $2x - 4y = 10$

$-\frac{2x}{4} \quad -\frac{2x}{4}$
 $\frac{-4y}{-4} = \frac{-2x + 10}{-4}$
 $y = \frac{1}{2}x - \frac{5}{2}$

$m = \frac{1}{2} \quad b = -\frac{5}{2}$

27. $y = 12$

\longleftrightarrow

$m = 0 \quad b = 12$

28. $x = -1$

\updownarrow

$m = \text{undefined} \quad b = \text{none}$

Determine if the lines are parallel, perpendicular or neither.

29. a.

$y = \frac{2}{3}x - 9$

$y = \frac{5}{2}x + 11$

neither

b.

$y = \frac{2}{3}x + 7$

$2x - 3y = 36$
 $-2x \quad -2x$

$\frac{-3y}{-3} = \frac{-2x + 36}{-3}$

$y = \frac{2}{3}x - 12$

parallel

c.

$x = 168$

\updownarrow

$y = -492$

\longleftrightarrow

perpendicular

Write the equation in slope-intercept form for the line that satisfies each set of conditions.

30. slope is 3, passes through (0,-6).

$$y = 3x - 6$$

31. slope $\frac{3}{4}$, passes through (-5,1).

$$\begin{aligned} y - 1 &= \frac{3}{4}(x + 5) \\ y - 1 &= \frac{3}{4}x + \frac{15}{4} \\ +1 & \qquad \qquad +1 \\ y &= \frac{3}{4}x + \frac{19}{4} \end{aligned}$$

32. passes through (-2,5) and (3,1).

$$m = \frac{1-5}{3-(-2)} = \frac{-4}{5}$$

$$y - 1 = \frac{-4}{5}(x - 3)$$

$$\begin{aligned} y - 1 &= \frac{-4}{5}x + \frac{12}{5} \\ +1 & \qquad \qquad +1 \\ y &= \frac{-4}{5}x + \frac{17}{5} \end{aligned}$$

33. passes through (7,1) and (6,2).

$$m = \frac{2-1}{6-7} = \frac{1}{-1} = -1$$

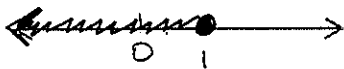
$$y - 2 = -1(x - 6)$$

$$\begin{aligned} y - 2 &= -x + 6 \\ +2 & \qquad \qquad +2 \\ y &= -x + 8 \end{aligned}$$

Solve each inequality. Graph the solution set.

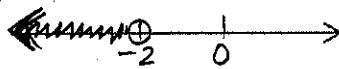
34. $2z + 5 \leq 7$

$$\begin{aligned} \frac{2z}{2} &\leq \frac{2}{2} \\ z &\leq 1 \end{aligned}$$



35. $\frac{-3x}{-3} > \frac{6}{-3}$

$$x < -2$$

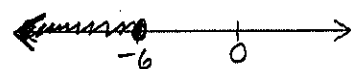


36. $-2(3f + 4) \geq 28$

$$\begin{aligned} -6f - 8 &\geq 28 \\ +8 & \qquad +8 \end{aligned}$$

$$\begin{aligned} -6f &\geq 36 \\ \frac{-6f}{-6} &\frac{36}{-6} \end{aligned}$$

$$f \leq -6$$



37. Which of the following is a solution to the inequality $2x - 5 > 9$?

a. 5

b. 6

c. 7

$$\frac{2x}{2} > \frac{14}{2}$$

$$x > 7$$

d. 8

38. Which of the following is NOT a solution to the inequality $2x + 12 \leq 3x - 5$?

a. 16

b. 17

c. 18

d. 19

$$\begin{aligned} 2x + 12 &\leq 3x - 5 \\ -12 & \qquad -12 \end{aligned}$$

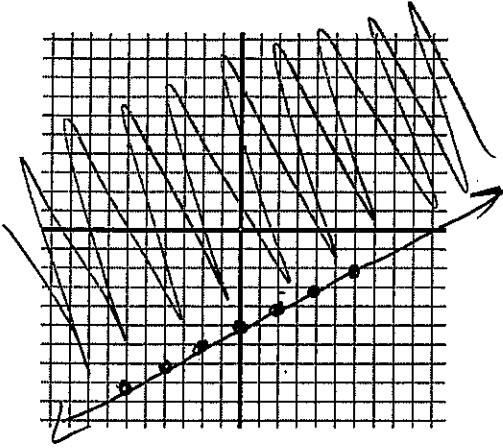
$$\begin{aligned} 2x &\leq 3x - 17 \\ -3x & \qquad -3x \end{aligned}$$

$$\begin{aligned} -x &\leq -17 \\ \frac{-x}{-1} &\frac{-17}{-1} \end{aligned}$$

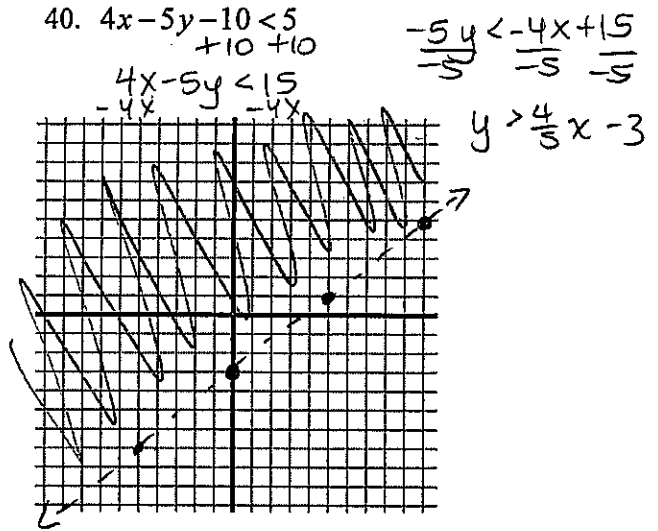
$$x \geq 17$$

Graph each inequality.

39. $y \geq \frac{1}{2}x - 5$



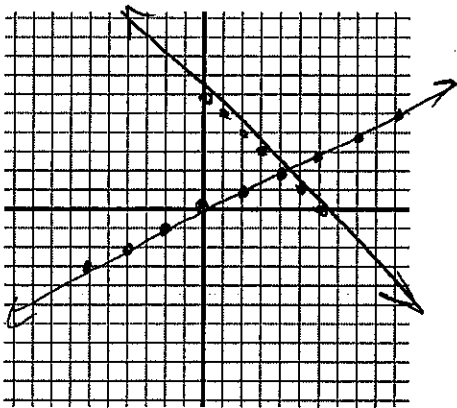
40. $4x - 5y - 10 < 5$



Unit 2: Systems of Linear Equations and Inequalities

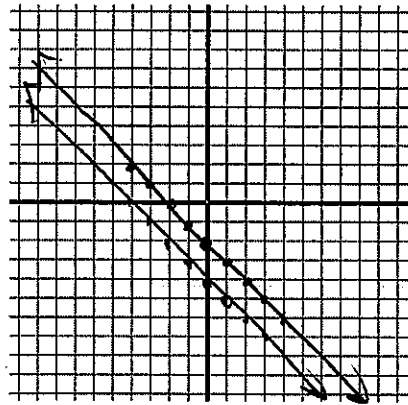
Graph the following systems of equations on the coordinate plane. Find the solution to the system.

41. $x - 2y = 0$ $x - 2y = 0$ $x + y = 6$
 $x + y = 6$ $-x -2y = -x$ $-x -y = -6$
 $-2y = -x$ $-2y = -x$ $y = -x + 6$
 $y = \frac{1}{2}x$



solution (4, 2)

42. $y = -x - 2$
 $x + y = -4$
 $-x -y = -4$
 $y = -x - 4$



solution no solution

Solve the system of equations by substitution or elimination:

$$-1(3x+2y=8)$$

$$43. \begin{array}{r} 2y=12-5x \\ +5x \quad +5x \end{array}$$

$$5x+2y=12$$

$$2y=12-5(2)$$

$$2y=12-10$$

$$\frac{2y}{2} = \frac{2}{2}$$

$$y=1$$

$$-3x-2y=-8$$

$$5x+2y=12$$

$$\frac{2x}{2} = \frac{4}{2}$$

$$x=2$$

$$(2, 1)$$

$$4(3x+5y=6)$$

$$44. \begin{array}{r} -4x+2y=5 \\ 3 \end{array}$$

$$-4x + \frac{1}{2}(\frac{3}{2}) = 5$$

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

$$-4x = \frac{7}{2}$$

$$x = -\frac{7}{8}$$

$$12x+20y=24$$

$$-12x+6y=15$$

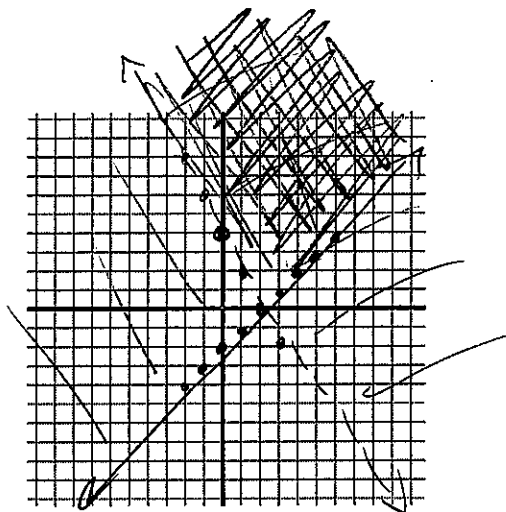
$$\frac{26y}{26} = \frac{39}{26}$$

$$y = \frac{3}{2}$$

$$(-\frac{1}{2}, \frac{3}{2})$$

Graph the following systems of inequalities on the coordinate plane. Shade the solution region.

$$45. \begin{array}{l} y > -2x+4 \\ y \leq x-2 \end{array}$$



$$46. \begin{array}{l} 3x+2y \geq 6 \\ 4x-y > 2 \end{array}$$

$$3x+2y \geq 6$$

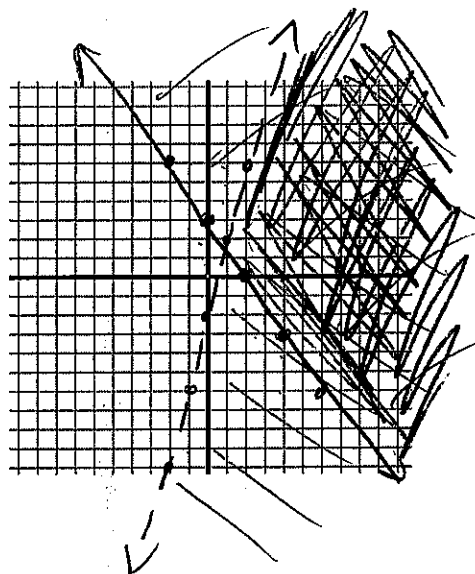
$$\frac{2y}{2} \geq \frac{-3x+6}{2}$$

$$y \geq -\frac{3}{2}x+3$$

$$4x-y > 2$$

$$-y > -4x+2$$

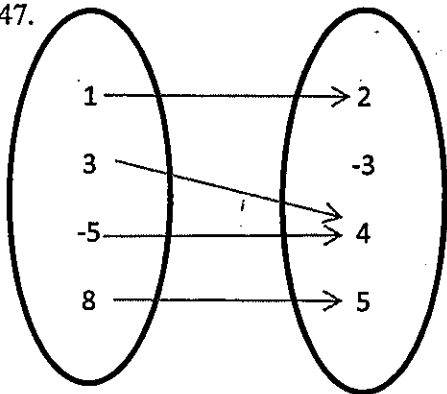
$$y < 4x-2$$



Unit 3: Relations and Functions

Determine if the relation is a function. State the domain and range.

47.



Function? yes

One-to-one? no

Domain: $\{-5, 1, 3, 8\}$

Range: $\{-3, 2, 4, 5\}$

Continuous or Discrete? discrete

49. $(7, 2), (4, 5), (6, 8), (9, -2), (7, 5)$

Function? no

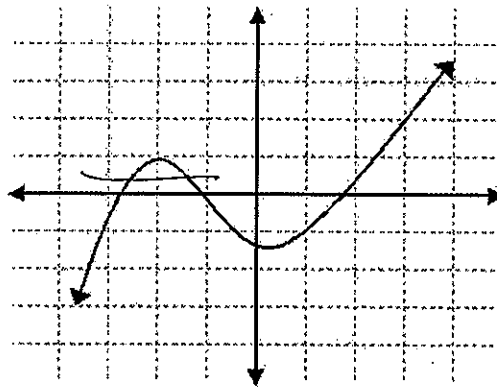
One-to-one? no

Domain: $\{4, 6, 7, 9\}$

Range: $\{-2, 2, 5, 8\}$

Continuous or Discrete? discrete

48.



Function? yes

One-to-one? no

Domain: $\{x | x \in \mathbb{R}\}$

Range: $\{y | y \in \mathbb{R}\}$

Continuous or Discrete? continuous

50.

| | |
|----|----|
| 3 | -4 |
| 5 | 6 |
| -2 | 8 |
| 9 | -4 |
| 0 | 1 |

Function? yes

One-to-one? no

Domain: $\{-2, 0, 3, 5, 9\}$

Range: $\{-4, 1, 6, 8\}$

Continuous or Discrete? discrete

Name the quadrant in which the point is located.

51. $(8, -6)$ IV

52. $(-7, -1)$ III

Evaluate the function.

53. $f(-3)$ if $f(x) = -4x - 8$

$$\begin{aligned} & -4(-3) - 8 \\ & 12 - 8 \\ & 4 \end{aligned}$$

54. $g(5)$ if $g(x) = -2x^2 - 4x + 1$

$$\begin{aligned} & -2(5)^2 - 4(5) + 1 \\ & -2(25) - 20 + 1 \\ & -50 - 20 + 1 \\ & -69 \end{aligned}$$

State whether each function is a linear function. Write yes or no then explain.

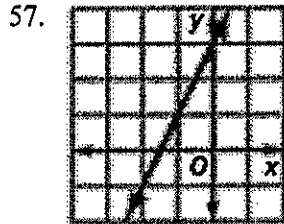
55. $g(x) = \frac{7-x}{x}$

no, variable in denominator

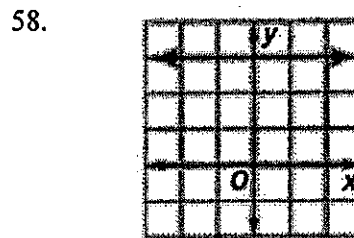
56. $12y = 4x + 8$

yes

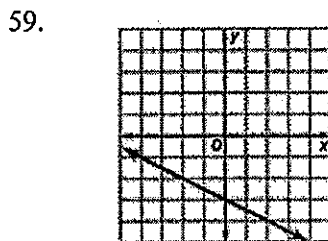
Describe the end behavior for each linear function.



$$\begin{aligned} \text{As } x \rightarrow \infty, f(x) & \rightarrow \underline{\infty} \\ \text{As } x \rightarrow -\infty, f(x) & \rightarrow \underline{-\infty} \end{aligned}$$



$$\begin{aligned} \text{As } x \rightarrow \infty, f(x) & \rightarrow \underline{3} \\ \text{As } x \rightarrow -\infty, f(x) & \rightarrow \underline{3} \end{aligned}$$

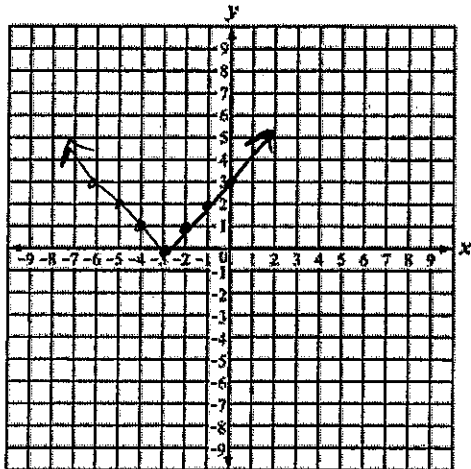


$$\begin{aligned} \text{As } x \rightarrow \infty, f(x) & \rightarrow \underline{-\infty} \\ \text{As } x \rightarrow -\infty, f(x) & \rightarrow \underline{\infty} \end{aligned}$$

Unit 4: Graphing Absolute Value and Quadratic Functions

Graph each of the following. State the domain and range.

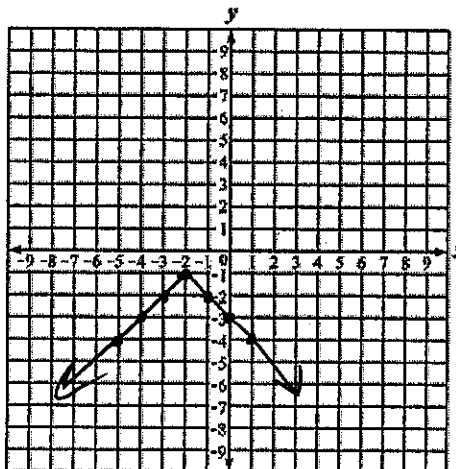
60. $f(x) = |x+3|$



Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \geq 0\}$

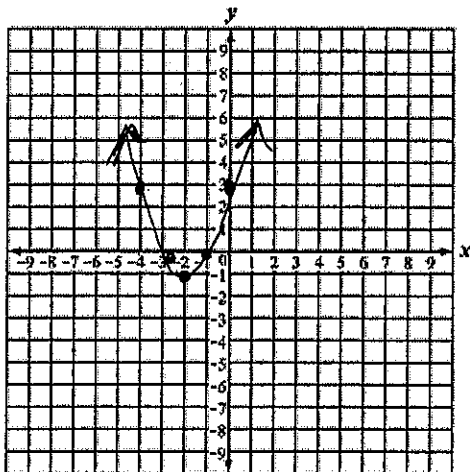
61. $f(x) = -|x+2| - 1$



Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \leq -1\}$

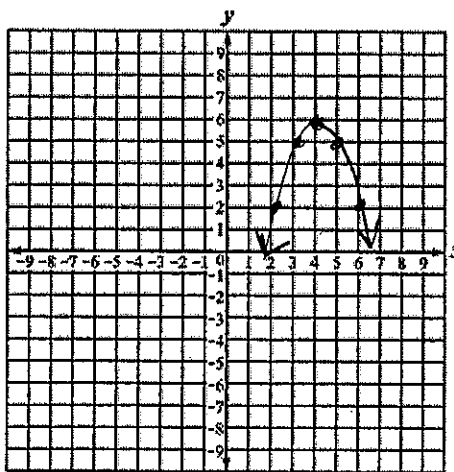
62. $y = (x+2)^2 - 1$



Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \geq -1\}$

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



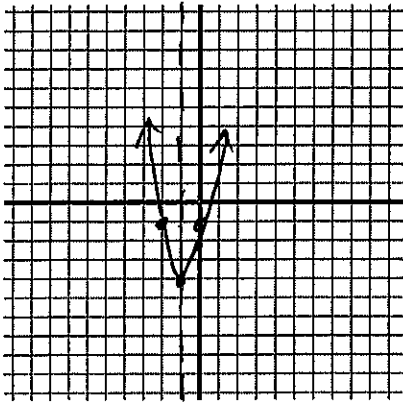
Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \leq 6\}$

Find the vertex, the y- intercept, the axis of symmetry and graph the quadratic equation. State whether the function has a maximum or minimum value and find that value.

64. $y = 3x^2 + 6x - 1$

$$x = \frac{-b}{2a} = \frac{-6}{2(3)} = \frac{-6}{6} = -1$$



Axis of symmetry $x = -1$

Vertex $(-1, -4)$ $3(-1)^2 + 6(-1) - 1$

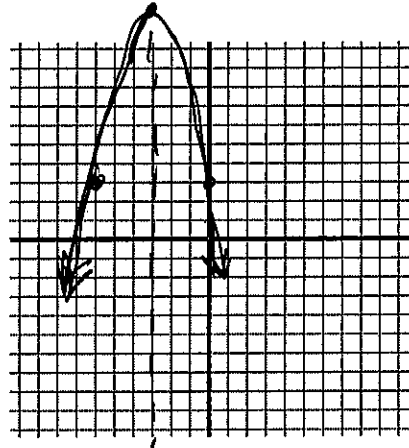
y- intercept $(0, -1)$

symmetric point $(-2, -1)$

Minimum/maximum -4

65. $y = -x^2 - 6x + 3$

$$x = \frac{-b}{2a} = \frac{6}{2(-1)} = \frac{6}{-2} = -3$$



Axis of symmetry $x = -3$

Vertex $(-3, 12)$ $-(-3)^2 - 6(-3) + 3$

y- intercept $(0, 3)$

symmetric point $(-6, 3)$

Minimum/maximum 12

Unit 5: Radicals, Complex Numbers, and Factoring

Foil each.

66. $(g-7)(g+4)$

$$g^2 + 4g - 7g - 28$$

$$g^2 - 3g - 28$$

67. $(3-2y)(3+2y)$

$$9 + 6y - 6y - 4y^2$$

$$9 - 4y^2$$

$$-4y^2 + 9$$

68. $(3x-1)^2$

$$(3x-1)(3x-1)$$

$$9x^2 - 3x - 3x + 1$$

$$9x^2 - 6x + 1$$

Simplify.

69. $-3\sqrt{20} + 15\sqrt{45} - 6\sqrt{80} + 10\sqrt{500}$

$$\begin{array}{r|l|l|l|l} -3\sqrt{4 \cdot 5} & 15\sqrt{9 \cdot 5} & -6\sqrt{16 \cdot 5} & 10\sqrt{5 \cdot 100} & \\ -3 \cdot 2\sqrt{5} & 15 \cdot 3\sqrt{5} & -6 \cdot 4\sqrt{5} & 10 \cdot 10\sqrt{5} & \\ -6\sqrt{5} & 45\sqrt{5} & -24\sqrt{5} & 100\sqrt{5} & \\ \hline & -6\sqrt{5} + 45\sqrt{5} & -24\sqrt{5} + 100\sqrt{5} & & \\ & 115\sqrt{5} & & & \end{array}$$

70. $(6\sqrt{5})^2$

$$(6\sqrt{5})(6\sqrt{5})$$

$$36\sqrt{25}$$

$$36 \cdot 5$$

$$180$$

Simplify.

71. $(3-\sqrt{5})^2$

$(3-\sqrt{5})(3-\sqrt{5})$

$9 - 3\sqrt{5} - 3\sqrt{5} + \sqrt{25}$

$9 - 6\sqrt{5} + 5$

$14 - 6\sqrt{5}$

72. $3b\sqrt{24a^3b^8c}$

$3b\sqrt{6 \cdot 4a^3b^8c}$

$3b \cdot 2ab^4\sqrt{6ac}$

$6ab^5\sqrt{6ac}$

73. $(x+\sqrt{10})(x-\sqrt{10})$

$x^2 - x\sqrt{10} + x\sqrt{10} - \sqrt{100}$

$x^2 - 10$

74. $(-3\sqrt{6})(2\sqrt{3})$

$-6\sqrt{18}$

$-6\sqrt{9 \cdot 2}$

$-6 \cdot 3\sqrt{2}$

$-18\sqrt{2}$

Rationalize the denominator.

75. $\frac{5}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{5\sqrt{3}}{\sqrt{9}}$

$\frac{5\sqrt{3}}{3}$

76. $\frac{10}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{10\sqrt{5}}{\sqrt{25}}$

$\frac{10\sqrt{5}}{5} = 2\sqrt{5}$

77. $\frac{\sqrt{6}}{\sqrt{3}} \sqrt{\frac{6}{3}} = \sqrt{2}$

Simplify.

78. $-2i \cdot 7i$

$-14i^2$

$-14(-1)$

14

79. $\sqrt{-100}$

$i\sqrt{100}$

$10i$

80. $\sqrt{-120}$

$i\sqrt{120}$

$i\sqrt{4 \cdot 30}$

$2i\sqrt{30}$

81. $-12i^2$

$-12(-1)$

12

82. $(3-4i)(2+5i)$

$6 + 15i - 8i - 20i^2$

$6 + 7i + 20$

$26 + 7i$

83. $(2-7i)^2$

$(2-7i)(2-7i)$

$4 - 14i - 14i + 49i^2$

$4 - 28i - 49$

$-45 - 28i$

Simplify.

$$84. (3-4i)+(-2-8i) \\ 1-12i$$

$$85. (6+3i)-(2-10i) \\ 4+13i$$

$$86. i^{16} = i^0 = 1$$

$$87. i^{23} = i^3 = -i$$

$$88. \sqrt{-10} \cdot \sqrt{-15} \\ i\sqrt{10} \cdot i\sqrt{15} \\ i^2\sqrt{150} \\ -1\sqrt{25 \cdot 6} \\ -5\sqrt{6}$$

$$89. (6i)(2i) \\ 12i^2 \\ 12(-1) \\ -12$$

Solve.

$$90. 3x^2 + 48 = 0 \\ -48 \quad -48 \\ 3x^2 = -48 \\ \frac{3}{3} \quad \frac{3}{3} \\ \sqrt{x^2} = \sqrt{16} \\ x = \pm 4i$$

$$91. 4x^2 = -32 \\ \frac{4}{4} \quad \frac{4}{4} \\ \sqrt{x^2} = \sqrt{8} \\ x = \pm i\sqrt{8} \\ x = \pm i\sqrt{4 \cdot 2} \\ x = \pm 2i\sqrt{2}$$

Factor the following by taking out the GCF.

$$92. 7y^3 + 3y^5 \\ y^3(7 + 3y^2)$$

$$93. 9x^3y^4 + 6x^2p^3 - 15y^2p \\ 3(3x^3y^2 + 2x^2p^3 - 5y^2p)$$

Factor the following by grouping.

$$94. (y^2 + y) + (5xy + 5x) \\ y(y+1) + 5x(y+1) \\ (y+1)(y+5x)$$

$$95. (21-7y) + (3x-xy) \\ 7(3-y) + x(3-y) \\ (3-y)(7+x)$$

Factor each trinomial.

96. $y^2 - 10y + 24$

$$(y - 6)(y - 4)$$

97. $z^2 - 6z - 16$

$$(z - 8)(z + 2)$$

98. $8y^2 + 10y - 3$

$$(4y - 1)(2y + 3)$$

99. $9x^2 - 18x + 8$

$$(3x - 2)(3x - 4)$$

Factor the following Difference of Squares.

100. $9x^2 - 25$

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

101. $a^2 - 16c^2$

$$(a + 4c)(a - 4c)$$

Factor the following Sum/Difference of Cubes.

102. $8x^3 - 27$

$$a = 2x \quad (2x - 3)(4x^2 + 6x + 9)$$
$$b = 3$$

103. $x^3 + 64y^3$

$$a = x \quad (x + 4y)(x^2 - 4xy + 16y^2)$$
$$b = 4y$$

Factor completely. Look for GCF first.

104. $2y^2 + 22y + 60$

$$2(y^2 + 11y + 30)$$

$$2(y + 5)(y + 6)$$

105. $3x^3 - 12x$

$$3x(x^2 - 4)$$

$$3x(x + 2)(x - 2)$$

Factor completely. Look for GCF first.

106. $n^2 + 2n - 1$

not factorable

107. $x^3y^2 + 3x^4y + 5x^5y^3$

$$x^3y(y + 3x + 5x^2y^2)$$

108. $2x^2 + 13x - 7$

$$(2x - 1)(x + 7)$$

109. $5x^2 - 30x + 40$

$$5(x^2 - 6x + 8)$$

$$5(x - 4)(x - 2)$$

Solve by factoring:

110. $2x^2 + 7x = 15$

$$\begin{array}{cc} -15 & -15 \end{array}$$

$$2x^2 + 7x - 15 = 0$$

$$(2x - 3)(x + 5) = 0$$

$$\begin{array}{cc} 2x - 3 = 0 & x + 5 = 0 \\ +3 & +3 \\ +3 & -5 \end{array}$$

$$\frac{2x}{2} = \frac{3}{2} \quad x = -5$$

$$x = \frac{3}{2}$$

112. $x^2 + 3x = 18$

$$\begin{array}{cc} -18 & -18 \end{array}$$

$$x^2 + 3x - 18 = 0$$

$$(x + 6)(x - 3) = 0$$

$$\begin{array}{cc} x + 6 = 0 & x - 3 = 0 \\ -6 & -6 \\ +3 & +3 \end{array}$$

$$x = -6 \quad x = 3$$

$$x = -6, 3$$

111. $x^2 = 6x$

$$\begin{array}{cc} -6x & -6x \end{array}$$

$$x^2 - 6x = 0$$

$$x(x - 6) = 0$$

$$x = 0 \quad \begin{array}{cc} x - 6 = 0 \\ +6 & +6 \end{array}$$

$$x = 6$$

$$x = 0, 6$$

113. $x^2 = 16x - 64$

$$\begin{array}{cc} -16x + 64 & -16x + 64 \end{array}$$

$$x^2 - 16x + 64 = 0$$

$$(x - 8)(x - 8) = 0$$

$$\begin{array}{cc} x - 8 = 0 & x - 8 = 0 \\ +8 & +8 \\ +8 & +8 \end{array}$$

$$x = 8 \quad x = 8$$

$$x = 8$$