5-1 Study Guide and Intervention

Graphing Quadratic Functions

Graph Quadratic Functions

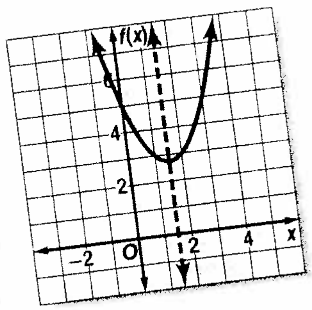
Quadratic Function	A function defined by an equation of the form $f(x) = ax^2 + bx + c$, where $a \neq 0$
Graph of a Quadratic Function	A **parabola** with these characteristics: y-intercept: c; axis of symmetry: $x = \frac{-b}{2a}$; x-coordinate of vertex: $\frac{-b}{2a}$

Example **Find the y-intercept, the equation of the axis of symmetry, and the x-coordinate of the vertex for the graph of $f(x) = x^2 - 3x + 5$. Use this information to graph the function.**

$a = 1$, $b = -3$, and $c = 5$, so the y-intercept is 5. The equation of the axis of symmetry is $x = \frac{-(-3)}{2(1)}$ or $\frac{3}{2}$. The x-coordinate of the vertex is $\frac{3}{2}$.

Next make a table of values for x near $\frac{3}{2}$.

x	$x^2 - 3x + 5$	f(x)	(x, f(x))
0	$0^2 - 3(0) + 5$	5	(0, 5)
1	$1^2 - 3(1) + 5$	3	(1, 3)
$\frac{3}{2}$	$\left(\frac{3}{2}\right)^2 - 3\left(\frac{3}{2}\right) + 5$	$\frac{11}{4}$	$\left(\frac{3}{2}, \frac{11}{4}\right)$
2	$2^2 - 3(2) + 5$	3	(2, 3)
3	$3^2 - 3(3) + 5$	5	(3, 5)



Exercises

Complete parts a–c for each quadratic function.

a. Find the y-intercept, the equation of the axis of symmetry, and the x-coordinate of the vertex.

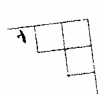
b. Make a table of values that includes the vertex.

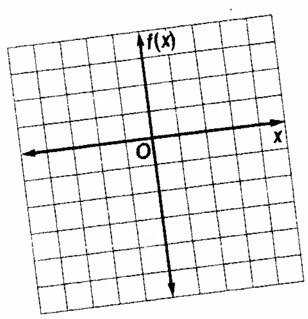
c. Use this information to graph the function.

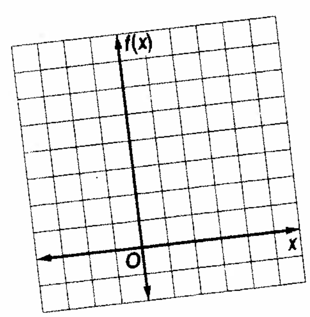
. $f(x) = x^2 + 6x + 8$

2. $f(x) = -x^2 - 2x + 2$

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







NAME ____________________ DATE ________ PERIOD ________

5-1 Study Guide and Intervention *(continued)*

Graphing Quadratic Functions

Maximum and Minimum Values The y-coordinate of the vertex of a quadratic function is the **maximum value** or **minimum value** of the function.

Maximum or Minimum Value of a Quadratic Function	The graph of $f(x) = ax^2 + bx + c$, where $a \neq 0$, opens up and has a minimum when $a > 0$. The graph opens down and has a maximum when $a < 0$.

Example **Determine whether each function has a *maximum* or *minimum* value, and find that value. Then state the domain and range of the function.**

a. $f(x) = 3x^2 - 6x + 7$

For this function, $a = 3$ and $b = -6$.

Since $a > 0$, the graph opens up, and the function has a minimum value.

The minimum value is the y-coordinate of the vertex. The x-coordinate of the vertex is $\frac{-b}{2a} = \frac{-(-6)}{2(3)} = 1$.

Evaluate the function at $x = 1$ to find the minimum value.

$f(1) = 3(1)^2 - 6(1) + 7 = 4$, so the minimum value of the function is 4. The domain is all real numbers. The range is all reals greater than or equal to the minimum value, that is $\{f(x) \mid f(x) \geq 4\}$.

b. $f(x) = 100 - 2x - x^2$

For this function, $a = -1$ and $b = -2$.

Since $a < 0$, the graph opens down, and the function has a maximum value.

The maximum value is the y-coordinate of the vertex. The x-coordinate of the vertex is $\frac{-b}{2a} = -\frac{-2}{2(-1)} = -1$.

Evaluate the function at $x = -1$ to find the maximum value.

$f(-1) = 100 - 2(-1) - (-1)^2 = 101$, so the maximum value of the function is 101. The domain is all real numbers. The range is all reals less than or equal to the maximum value, that is $\{f(x) \mid f(x) \leq 101\}$.

Exercises

Determine whether each function has a *maximum* or *minimum* value, and find that value. Then state the domain and range of the function.

1. $f(x) = 2x^2 - x + 10$

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

3. $f(x) = 3x^2 - 3x + 1$

4. $f(x) = x^2 + 5x + 2$

5. $f(x) = 20 + 6x - x^2$

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

7. $f(x) = -x^2 - 4x + 10$

8. $f(x) = x^2 - 10x + 5$

9. $f(x) = -6x^2 + 12x + 21$

NAME ______________________ DATE ____________ PERIOD ____________

5-1 Practice

Graphing Quadratic Functions

Complete parts a–c for each quadratic function.

a. Find the y-intercept, the equation of the axis of symmetry, and the x-coordinate of the vertex.

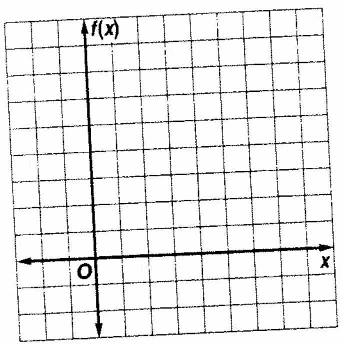
b. Make a table of values that includes the vertex.

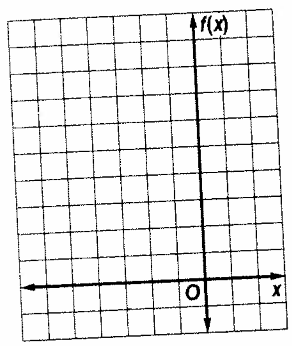
c. Use this information to graph the function.

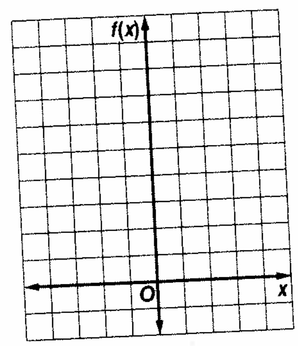
1. $f(x) = x^2 - 8x + 15$

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

3. $f(x) = 2x^2 - 2x + 1$







Determine whether each function has a *maximum* or *minimum* value, and find that value. Then state the domain and range of the function.

4. $f(x) = x^2 + 2x - 8$

5. $f(x) = x^2 - 6x + 14$

6. $v(x) = -x^2 + 14x - 57$

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

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

9. $f(x) = -\frac{2}{3}x^2 + 8x - 24$

10. GRAVITATION From 4 feet above a swimming pool, Susan throws a ball upward with a velocity of 32 feet per second. The height $h(t)$ of the ball t seconds after Susan throws it is given by $h(t) = -16t^2 + 32t + 4$. For $t \geq 0$, find the maximum height reached by the ball and the time that this height is reached.

11. HEALTH CLUBS Last year, the SportsTime Athletic Club charged $20 to participate in an aerobics class. Seventy people attended the classes. The club wants to increase the class price this year. They expect to lose one customer for each $1 increase in the price.

a. What price should the club charge to maximize the income from the aerobics classes?

b. What is the maximum income the SportsTime Athletic Club can expect to make?

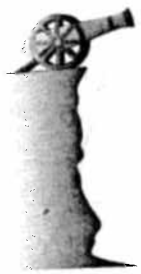
3

NAME ____________________ DATE __________ PERIOD __________

5-1 Word Problem Practice

Graphing Quadratic Functions

1. TRAJECTORIES A cannonball is launched from a cannon on the wall of Fort Chambly, Quebec. If the path of the cannonball is traced on a piece of graph paper aligned so that the cannon is situated on the y-axis, the equation that describes the path is



$$y = -\frac{1}{1600}x^2 + \frac{1}{2}x + 20,$$

where x is the horizontal distance from the cliff and y is the vertical distance above the ground in feet. How high above the ground is the cannon?

2. TICKETING The manager of a symphony computes that the symphony will earn $-40P^2 + 1100P$ dollars per concert if they charge P dollars for tickets. What ticket price should the symphony charge in order to maximize its profits?

3. ARCHES An architect decides to use a parabolic arch for the main entrance of a science museum. In one of his plans, the top edge of the arch is described by the graph of $y = -\frac{1}{4}x^2 + \frac{5}{2}x + 15$. What are the coordinates of the vertex of this parabola?

4. FRAMING A frame company offers a line of square frames. If the side length of the frame is s, then the area of the opening in the frame is given by the function $a(s) = s^2 - 10s + 24$. Graph $a(s)$.

5. WALKING Canal Street and Walker Street are perpendicular to each other. Evita is driving south on Canal Street and is currently 5 miles north of the intersection with Walker Street. Jack is at the intersection of Canal and Walker Streets and heading east on Walker. Jack and Evita are both driving 30 miles per hour.

a. When Jack is x miles east of the intersection, where is Evita?

b. The distance between Jack and Evita is given by the formula $\sqrt{x^2 + (5 - x)^2}$. For what value of x are Jack and Evita at their closest? (Hint: Minimize the square of the distance.)

c. What is the distance of closest approach?

Lesson 5-1

NAME ______________________ DATE ____________ PERIOD ____________

5-2 Study Guide and Intervention

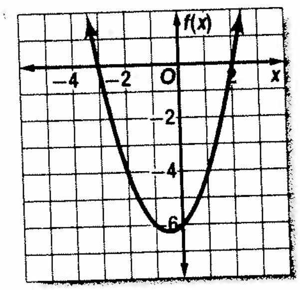
Solving Quadratic Equations by Graphing

Solve Quadratic Equations

Quadratic Equation	A quadratic equation has the form $ax^2 + bx + c = 0$, where $a \neq 0$.
Roots of a Quadratic Equation	solution(s) of the equation, or the zero(s) of the related quadratic function

The zeros of a quadratic function are the x-intercepts of its graph. Therefore, finding the x-intercepts is one way of solving the related quadratic equation.

Example **Solve $x^2 + x - 6 = 0$ by graphing.**



Graph the related function $f(x) = x^2 + x - 6$.

The x-coordinate of the vertex is $\frac{-b}{2a} = -\frac{1}{2}$, and the equation of the axis of symmetry is $x = -\frac{1}{2}$.

Make a table of values using x-values around $-\frac{1}{2}$.

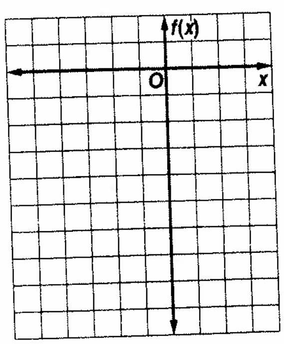
x	−1	$-\frac{1}{2}$	0	1	2
f(x)	−6	$-6\frac{1}{4}$	−6	−4	0

From the table and the graph, we can see that the zeros of the function are 2 and −3.

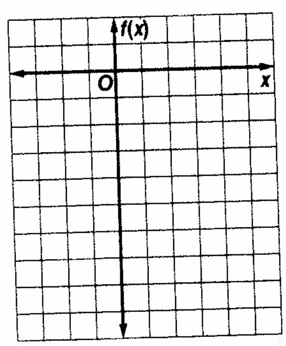
Exercises

Use the related graph of each equation to determine its solution.

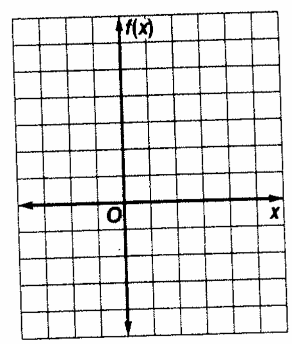
1. $x^2 + 2x - 8 = 0$



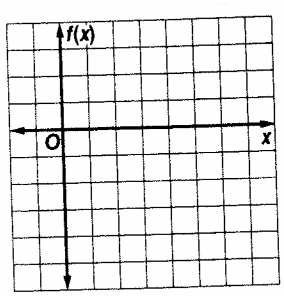
2. $x^2 - 4x - 5 = 0$



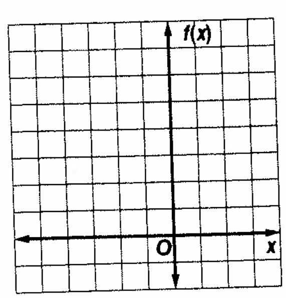
3. $x^2 - 5x + 4 = 0$



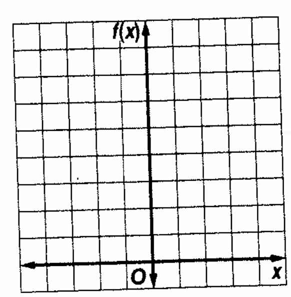
4. $x^2 - 10x + 21 = 0$



5. $x^2 + 4x + 6 = 0$



6. $4x^2 + 4x + 1 = 0$



Lesson 5-2

NAME ______________________ DATE __________ PERIOD __________

5-2 Study Guide and Intervention *(continued)*

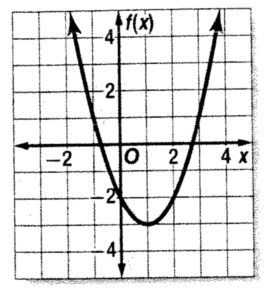
Solving Quadratic Equations by Graphing

Estimate Solutions Often, you may not be able to find exact solutions to quadratic equations by graphing. But you can use the graph to estimate solutions.

Example **Solve $x^2 - 2x - 2 = 0$ by graphing. If exact roots cannot be found, state the consecutive integers between which the roots are located.**

The equation of the axis of symmetry of the related function is $x = -\frac{-2}{2(1)} = 1$, so the vertex has x-coordinate 1. Make a table of values.

x	−1	0	1	2	3
$f(x)$	1	−2	−3	−2	1

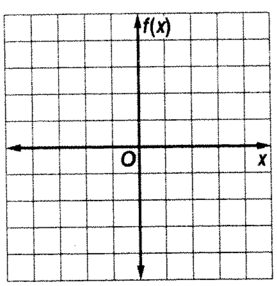


The x-intercepts of the graph are between 2 and 3 and between 0 and −1. So one solution is between 2 and 3, and the other solution is between 0 and −1.

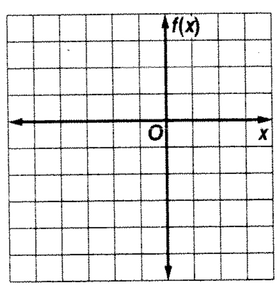
Exercises

Solve the equations. If exact roots cannot be found, state the consecutive integers between which the roots are located.

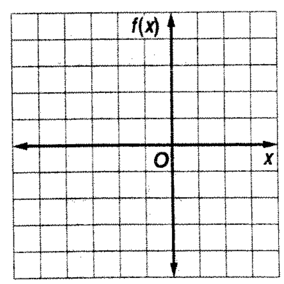
1. $x^2 - 4x + 2 = 0$



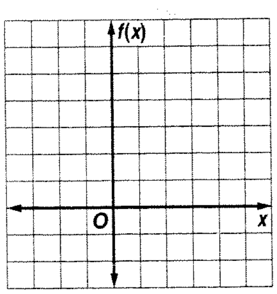
2. $x^2 + 6x + 6 = 0$



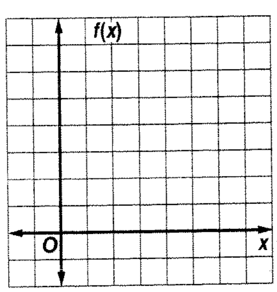
3. $x^2 + 4x + 2 = 0$



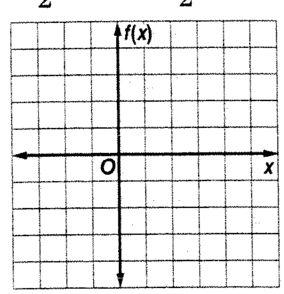
4. $-x^2 + 2x + 4 = 0$

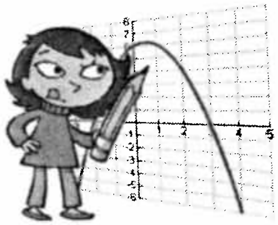


5. $2x^2 - 12x + 17 = 0$



6. $-\frac{1}{2}x^2 + x + \frac{5}{2} = 0$



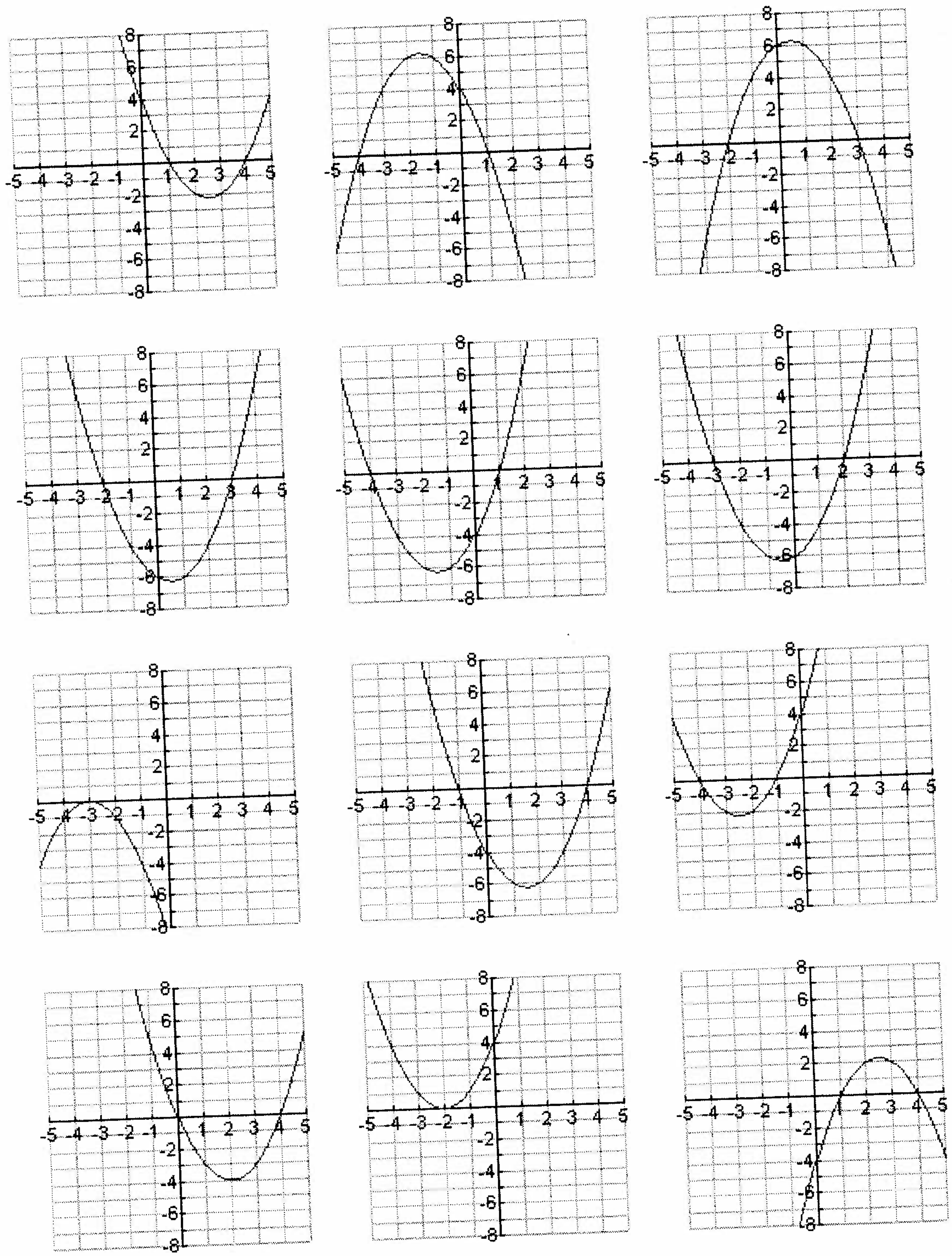


Graphing From Intercept Form

When done with activity, you should be able to graph quadratic equations in intercept form by hand.

Part A: Using your calculator as needed, match each equation to its graph.

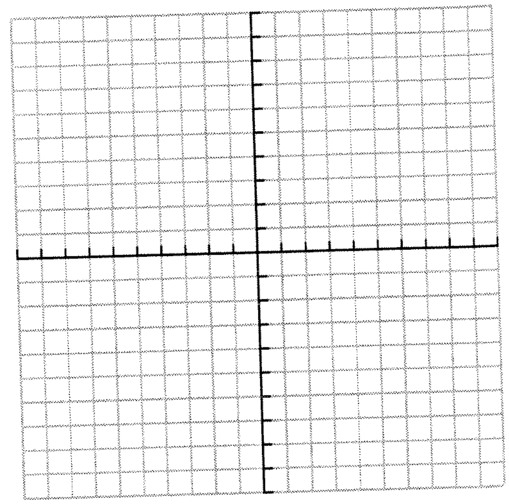
1. $y = -(x+2)(x-3)$
2. $f(x) = (x-2)(x+3)$
3. $g(x) = (x-3)(x+2)$
4. $h(x) = (x-4)(x+1)$
5. $k(x) = (x-1)(x+4)$
6. $t(x) = -(x-1)(x+4)$
7. $y = (x-1)(x-4)$
8. $y = -(x-1)(x-4)$
9. $f(x) = (x-0)(x-4)$
10. $g(x) = (x+2)(x+2)$
11. $h(x) = -(x+3)(x+3)$
12. $k(x) = (x+4)(x+1)$



What do you see that helps match the equations to their graphs quickly?

Part B: Look carefully at quadratic graphs when the equation is in factored form.

1. Let's try to make a high quality graph of the $y=(x-2)(x+4)$ by hand. Follow these steps.



   a. What are the two x-intercepts? Plot them on the grid.

   b. Since quadratic graphs are symmetrical, find the line of symmetry by finding the x-coordinate of the point half way between the x-intercepts. Draw it in on the grid.

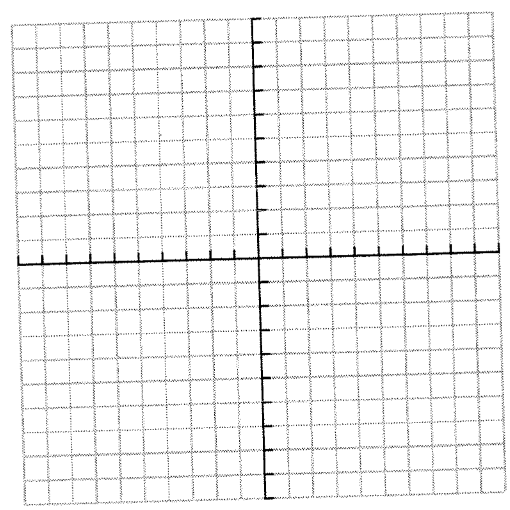
   c. The vertex lies on the line of symmetry. What is the *x* value for your line of symmetry? x = ______
   Use the equation $y=(x-2)(x+4)$ to find the value of *y* when x = ______ (the value of the line of symmetry). Plot this on the grid.

   d. The y-intercept occurs when *x* = 0. Use the equation $y=(x-2)(x+4)$ to find the value of *y* when x = 0. Plot this on the grid.

   e. Using the line of symmetry, find another point that should be part of the graph of $y=(x-2)(x+4)$.
   (Hint: the vertical intercept can be reflected.)

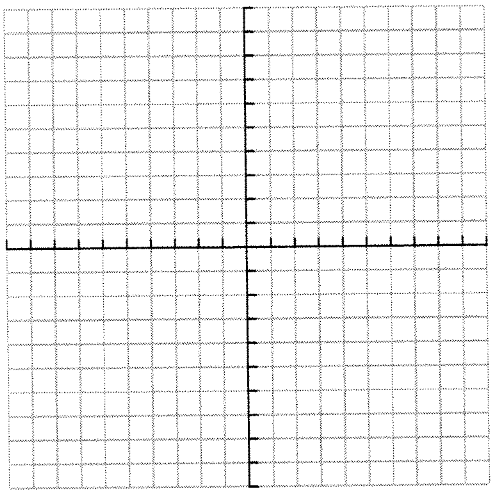
   f. With your five points plotted, try to sketch a smooth curve for the graph of $y=(x-2)(x+4)$.

2. Use the same strategy as above to graph of $f(x)=(x-5)(x+1)$ by hand. Be sure to label points on your graph.

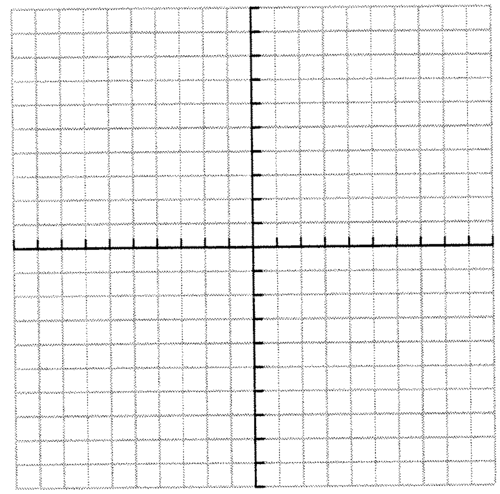


3. Make graphs of the following by hand. You may need a different scale for some.

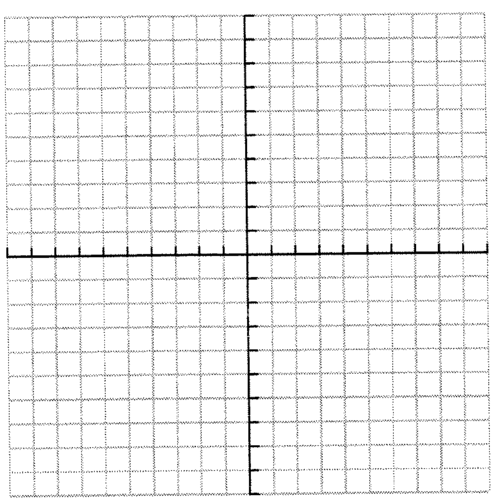
$g(x) = (x-1)(x-7)$



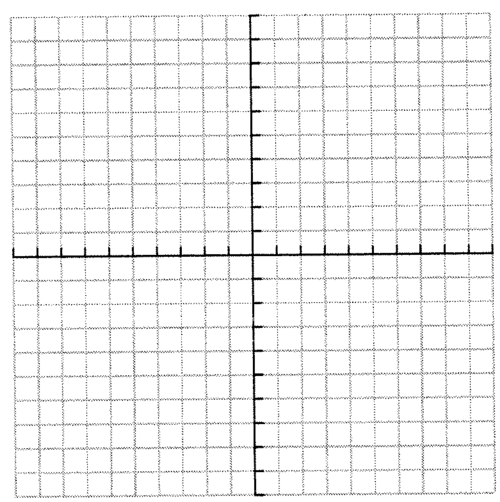
$h(x) = (x+2)(x-6)$



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



$y = -0.5(x+4)(x-6)$



Part C: Summarize your thoughts.

Suppose a friend of yours was absent and needs to get caught up quickly. Write your explanations to the following with your friend in mind. Be extra clear with your words.

1. Explain how you see the *x*-intercepts (also called roots or zeros) in the function $y=(x-8)(x+10)$ without graphing it.

2. Describe how you can find the roots for any quadratic function written in factored form by looking at just the equation.

3. Explain how you can find the line of symmetry if you know the *x* intercepts of a quadratic function written in factored form by looking at just the equation.

4. Explain how you can find the *y*-intercept of a quadratic function written in factored form by looking at just the equation.

5. Explain a strategy you can use for graphing a quadratic function by hand when it's written in factored form.

Activity 2.2.2 Multiplying and Factoring

1. Multiply a monomial by a binomial using the 'in direction' of the distributive property:

Multiply out the following:

a. $3x(4x + 5)$

b. $7(4x + 5)$

c. Now multiply 4x+5 by both 3x and 7 as written: $(3x + 7)(4x + 5)$

we can say and write: "3x multiplies (4x+5) AND 7 multiplies (4x+5)"

3x(4x+5) 7(4x+5)

____________ + ____________

Combine like terms: ____________________

2. Multiply

a. $x(x - 3)$

b. $-2(x - 3)$

c. $(x - 2)(x - 3)$

3. Observe patterns when you multiply the following binomials:

a. $(x + 5)(x + 7) =$

b. $(x - 5)(x - 7) =$

c. $(x + 5)(x - 7) =$

d. $(x - 5)(x + 7) =$

4. Observe patterns when you multiply the following binomials:

a. $(x+11)(x+1)$ $=$

b. $(x-11)(x-1)$ $=$

c. $(x+11)(x-1)$ $=$

d. $(x-11)(x+1)$ $=$

5. Observe patterns (assume c and d are positive numbers).

a. $(x+c)(x+d)$ $=$

b. $(x-c)(x-d)$ $=$

c. $(x+c)(x-d)$ $=$

d. $(x-c)(x+d)$ $=$

6. Fill in the blanks or answer the following questions in full sentences to explain the patterns you observed. You may use the letters c or d to indicate the second terms of the binomials. Other words you may want to use are: positive, negative, same sign, different sign, sum, product, factor, trinomial. perfect square trinomial, difference of two squares, middle term, last term.

a. The product of two binomials, (x-c)(x-d), is a ____________________

b. When will the product of two binomials give an answer that has a last term that is negative?

c. When will the product of two binomials give an answer that has a last term that is positive?

d. When will the product of the form $(x+c)(x-d)$give you an answer that has a middle term that is positive?

e. When you multiply two binomials, what is the coefficient of the middle term of their product?

f. When you multiply two binomials, what is the last term of their product?

g. What other patterns did you notice?

12

Special Products:

7. Multiply:

a. $(x + 5)(x - 5)$ b. $(2x + 9)(2x - 9)$

c. What pattern do you notice when you multiply binomials of the form $(x + c)(x - c)$?

d. What is the "middle term" in the product?

e. What special name is given to this product?

8. Multiply:

a. $(x + 6)(x + 6)$ b. $(5x - 6)(5x - 6)$ c. $(x + 7)^2$

d. What pattern do you notice when you multiply binomials of the form: $(x + c)(x + c)$ *also written as* $(x + c)^2$?

e. What special name is given to the trinomial that results from squaring a binomial?

13

FACTORING:

9. Recall that multiplying -2 times 3 equals negative 6.

a. We say that one pair of factors of -6 is -2 and 3. List 3 other pair of factors of negative six.

b. We also say that we can take 3 out of -6 meaning -6 divided by __ is ___; or $\frac{-6}{3} = -2$

c. What does it mean to factor an algebraic expression?

10. Factor the following by "taking out" a factor common to both terms. This is the "out direction" of the distributive property.

a. 15x+9 = (3)(5x) + (3)(3) = (__)(___ +____)

b. $28x^2 + 6x$= ________________

c. $6x^2 - 2x$=__________________

11. Use the patterns you observed when multiplying binomials or any other method to factor the following. If the polynomial does not factor over the integers, write "prime".

a. x^2+15x+56 =

b. x^2-15x+56 =

c. x^2+x-56 =

d. x^2-x - 56 =

e. x^2+x+7 =

f. x^2+ x - 6 =

14

g. x^2+0x-49 =
(could be written x^2- 49)

h.. $36x^2$+0x-1=

i. x^2+0x+49=

j. x^2+(5+3)x+5(3)=

12. Observe patterns when you multiply the following binomials:

a. $(3x+5)(2x+7)$ =

b. $(2x+5)(3x+7)$ =

c. $(3x-5)(2x-7)$ =

d. $(2x-5)(3x-7)$ =

e. $(3x+5)(2x-7)$ =

f. $(2x+5)(3x-7)$ =

Now factor the following:

g. $6x^2$+19x -7=

h. $6x^2$-11x -7=

15

"What is a cow's favorite school subject?"

Factor the following expressions. Watch out for GCFs.
The answer to each problem will match a letter that will allow you to figure out the joke.

1. $x^2 + 6x + 5$

2. $x^2 - 9x + 14$

3. $x^2 - 26x + 48$

4. $x^2 + 17x + 30$

5. $2x^2 + 6x + 4$

6. $-x^2 + 10x - 16$

7. $4x^3 - 36x^2 + 32x$

8. $-3x^2 - 57x - 102$

U. $(x + 15)(x + 2)$

C. $-3(x + 17)(x + 2)$

R. $(x + 2)(x + 3)$

O. $2(x + 1)(x + 2)$

T. $(x + 30)(x + 1)$

S. $(x - 2)(x - 7)$

N. $(x + 2)(x + 5)$

C. $-(x - 8)(x - 2)$

W. $(x - 24)(x - 2)$

M. $(x - 1)(x - 3)$

L. $4x(x - 8)(x - 1)$

U. $(x + 5)(x + 1)$

B. $(x - 24)(x - 3)$

F. $(x - 14)(x - 7)$

A. $-3(x - 12)(x - 2)$

__ __ __ __ __ __ __ __
8 5 3 6 1 7 4 2

16

"What do you call a bunch of chickens playing hide-and-seek?"

Factor the following expressions. Watch out for GCFs.
The answer to each problem will match a letter that will allow you to figure out the joke.

1. $x^2 - 3x - 10$

2. $x^2 + 3x - 18$

3. $x^2 - 19x - 42$

4. $x^2 + 5x - 50$

5. $-x^2 - 7x + 8$

6. $2x^2 + 6x - 56$

7. $3x^2 - 24x - 60$

8. $4x^3 - 4x^2 - 8x$

O. $(x + 10)(x - 5)$

R. $-(x + 4)(x - 2)$

L. $2(x + 7)(x - 4)$

E. $4(x + 2)(x - 1)$

S. $2(x + 14)(x - 2)$

F. $4x(x - 2)(x + 1)$

W. $(x + 6)(x - 3)$

Y. $-(x + 8)(x - 1)$

T. $3(x + 5)(x - 4)$

A. $(x - 5)(x + 2)$

L. $(x - 21)(x + 2)$

H. $(x + 9)(x - 2)$

P. $3(x - 10)(x + 2)$

17

___ ___ ___ ___   ___ ___ ___ ___
8 4 2 6   7 3 1 5

Algebra 2 (Conway)

Name______________________________________

Date__________________ Period____

5.2.3 - Factoring Quadratic Expressions

Factor each completely.

1) $r^2 - 7r - 30$

2) $r^2 + r - 56$

3) $n^2 - 7n + 12$

4) $x^2 - x - 30$

5) $n^2 - 8n + 7$

6) $x^2 + 5x - 14$

7) $x^2 + 14x + 24$

8) $m^2 + 17m + 72$

9) $m^2 + 16m + 55$

10) $b^2 - 22b + 120$

11) $6x^2 + 24x - 462$

12) $6r^2 - 72r + 192$

13) $7a^2 - 49a - 210$

14) $2n^2 - 18n - 72$

15) $5a^2 - 180$

16) $5n^2 + 5n - 360$

18

NAME ______________________ DATE __________ PERIOD __________

5-3 Study Guide and Intervention *(continued)*

Solving Quadratic Equations by Factoring

Solve Equations by Factoring When you use factoring to solve a quadratic equation, you use the following property.

Zero Product Property	For any real numbers *a* and *b*, if $ab = 0$, then either $a = 0$ or $b = 0$, or both *a* and $b = 0$.

Example **Solve each equation by factoring.**

a. $3x^2 = 15x$

$3x^2 = 15x$ Original equation

$3x^2 - 15x = 0$ Subtract 15*x* from both sides.

$3x(x - 5) = 0$ Factor the binomial.

$3x = 0$ or $x - 5 = 0$ Zero Product Property

$x = 0$ or $x = 5$ Solve each equation.

The solution set is $\{0, 5\}$.

b. $4x^2 - 5x = 21$

$4x^2 - 5x = 21$ Original equation

$4x^2 - 5x - 21 = 0$ Subtract 21 from both sides.

$(4x + 7)(x - 3) = 0$ Factor the trinomial.

$4x + 7 = 0$ or $x - 3 = 0$ Zero Product Property

$x = -\frac{7}{4}$ or $x = 3$ Solve each equation.

The solution set is $\left\{-\frac{7}{4}, 3\right\}$.

Exercises

Solve each equation by factoring.

1. $6x^2 - 2x = 0$

2. $x^2 = 7x$

3. $20x^2 = -25x$

4. $6x^2 = 7x$

5. $6x^2 - 27x = 0$

6. $12x^2 - 8x = 0$

7. $x^2 + x - 30 = 0$

8. $2x^2 - x - 3 = 0$

9. $x^2 + 14x + 33 = 0$

10. $4x^2 + 27x - 7 = 0$

11. $3x^2 + 29x - 10 = 0$

12. $6x^2 - 5x - 4 = 0$

13. $12x^2 - 8x + 1 = 0$

14. $5x^2 + 28x - 12 = 0$

15. $2x^2 - 250x + 5000 = 0$

16. $2x^2 - 11x - 40 = 0$

17. $2x^2 + 21x - 11 = 0$

18. $3x^2 + 2x - 21 = 0$

19. $8x^2 - 14x + 3 = 0$

20. $6x^2 + 11x - 2 = 0$

21. $5x^2 + 17x - 12 = 0$

22. $12x^2 + 25x + 12 = 0$

23. $12x^2 + 18x + 6 = 0$

24. $7x^2 - 36x + 5 = 0$

19

NAME ______________________ DATE ____________ PERIOD ____________

5-3 Skills Practice

Solving Quadratic Equations by Factoring

Write a quadratic equation in standard form with the given root(s).

1. 1, 4

2. 6, −9

3. −2, −5

4. 0, 7

5. $-\frac{1}{3}, -3$

6. $-\frac{1}{2}, \frac{3}{4}$

Factor each polynomial.

7. $m^2 + 7m - 18$

8. $2x^2 - 3x - 5$

9. $4z^2 + 4z - 15$

10. $4p^2 + 4p - 24$

11. $3y^2 + 21y + 36$

12. $c^2 - 100$

Solve each equation by factoring.

13. $x^2 = 64$

14. $x^2 - 100 = 0$

15. $x^2 - 3x + 2 = 0$

16. $x^2 - 4x + 3 = 0$

17. $x^2 + 2x - 3 = 0$

18. $x^2 - 3x - 10 = 0$

19. $x^2 - 6x + 5 = 0$

20. $x^2 - 9x = 0$

21. $x^2 - 4x = 21$

22. $2x^2 + 5x - 3 = 0$

23. $4x^2 + 5x - 6 = 0$

24. $3x^2 - 13x - 10 = 0$

20

25. NUMBER THEORY Find two consecutive integers whose product is 272.

Lesson 5-3

Factoring Checklist

1. GCF

2. Difference of Squares
   $x^2 - y^2 = (x + y)(x - y)$

3. Cubes
   a. Difference of Cubes
      $x^3 - y^3 = (x - y)(x^2 + xy + y^2)$

   b. Sum of Cubes
      $x^3 + y^3 = (x + y)(x^2 - xy + y^2)$

4. Trinomials
   a. Trinomial Square
      $x^2 +/- 2xy + y^2 = (x +/- y)^2$

   b. Sum and Product
      $x^2 + bx + c$
      What 2 numbers have a product of c and a sum of b?

   c. A * C Method (can be used for all trinomials)
      $ax^2 + bx + c$
      What 2 numbers have a product of ac and a sum of b?
      factor by grouping or box method

5. Grouping with four terms

FACTOR FLOW CHART

GREATEST COMMON FACTOR (GCF)

↓

HOW MANY TERMS DO YOU HAVE?

2

IS IT THE DIFFERENCE OF SQUARES?

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

OR ↓

IS IT THE DIFFERENCE OF CUBES?

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

OR ↓

IS IT THE SUM OF CUBES?

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

3

IS IT A PERFECT SQUARE TRINOMIAL?

$$x^2 + 2xy + y^2 = (x + y)(x + y)$$

NO? ↓

TRY THESE:

- TRIAL & ERROR
- SPLIT THE MIDDLE TERM

4

FACTOR USING THE GROUPING PROCESS