2.1 Add and Subtract Polynomials

Georgia Performance Standard(s)
MM1A2c

Your Notes

Goal • Add and subtract polynomials.

VOCABULARY

Monomial

Degree of a monomial

Polynomial

Degree of a polynomial

Leading coefficient

Binomial

Trinomial

Example 1 ***Rewrite a polynomial***

Write $7 + 2x^4 - 4x$ so that the exponents decrease from left to right. Identify the degree and the leading coefficient of the polynomial.

Solution

Consider the degree of each of the polynomial's terms.

Degree is ___. Degree is ___. Degree is ___.

$$7 + 2x^4 - 4x$$

The polynomial can be written as _______________. The greatest degree is ___, so the degree of the polynomial is ___, and the leading coefficient is ___.

Your Notes

✔ ***Checkpoint*** **Write the polynomial so that the exponents decrease from left to right. Identify the degree and the leading coefficient of the polynomial.**

1. $5x + 13 + 8x^3$

2. $4y^4 - 7y^5 + 2y$

3. $-5m^2 + 1 - 9m$

4. $2r^3 + 4r^4 + r - 5r^2$

Example 2 ***Add polynomials***

Find the sum (a) $(4x^3 + x^2 - 5) + (7x + x^3 - 3x^2)$ and (b) $(x^2 + x + 8) + (x^2 - x - 1)$.

Solution

a. Vertical format: Align like terms in vertical columns.

$$\begin{array}{rrrr} 4x^3 + & x^2 & & - 5 \\ + \quad x^3 - & 3x^2 & + 7x & \\ \hline \\ \hline \end{array}$$

If a particular power of the variable appears in one polynomial but not the other, leave a space in that column, or write the term with a coefficient of 0.

b. Horizontal format: Group like terms and simplify.

$(x^2 + x + 8) + (x^2 - x - 1)$

$= (\_\_\_\_\_\_) + (\_\_\_\_\_\_) + (\_\_\_\_\_\_)$

$= \_\_\_\_\_\_$

Your Notes

✔ ***Checkpoint*** **Find the sum.**

5. $(3x^4 - 2x^2 - 1) + (5x^3 - x^2 + 9x^4)$

6. $(4x^2 - 15 + 6x^3) + (8x + 24 + x^2)$

Example 3 ***Subtract polynomials***

Find the difference (a) $(4z^2 - 3) - (-2z^2 + 5z - 1)$ and (b) $(3x^2 + 6x - 4) - (x^2 - x - 7)$.

Solution

a. $\quad (4z^2 \quad - 3)$ $\quad\quad$ $4z^2 \quad - 3$

$- (-2z^2 + 5z - 1)$ → ___ $2z^2$ ___ $5z$ ___ 1

____

b. $(3x^2 + 6x - 4) - (x^2 - x - 7)$

$= 3x^2 + 6x - 4$ ____________

$=$ ________________________

$=$ ____________

Remember to multiply *each* term in the polynomial by −1 when you write the subtraction as addition.

✔ ***Checkpoint*** **Find the difference.**

7. $(3t^2 - 5t + t^4) - (11t^4 - 3t^2)$

8. $(4p^3 + 3p - 6) - (-2p^3 - p^2 + 3)$

Homework

Name ______________________ Date ______________

LESSON 2.1

Practice

Write the polynomial so that the exponents decrease from left to right. Identify the degree and the leading coefficient of the polynomial.

1. $8n^6$
2. $-9z + 1$
3. $4 + 2x^5$
4. $18x - x^2 + 2$
5. $3y^3 + 4y^2 + 8$
6. $m - 20m^3 + 5$
7. $-8 + 10a^4 - 3a^7$
8. $4z + z^3 - 5z^2 + 6z^4$
9. $8h^3 - 6h^4 + h^7$

Tell whether the expression is a polynomial. If it is a polynomial, find its degree and classify it by the number of its terms. Otherwise, tell why it is not a polynomial.

10. $6m^2$
11. 3^x
12. $y^{-2} + 4$
13. $3b^2 - 2$
14. $\frac{1}{2}x^2 - 2x + 1$
15. $6x^3 - 1.4x$

Find the sum or difference.

16. $(6x + 4) + (x + 5)$
17. $(4m^2 - 5) + (3m^2 - 2)$
18. $(2y^2 + y - 1) + (7y^2 + 4y - 3)$
19. $(3x^2 + 5) - (x^2 + 2)$

Name ______________________ Date ______________

LESSON 2.1

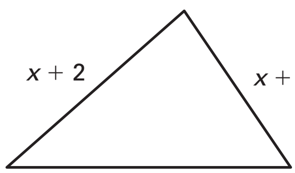
Practice *continued*

20. $(10a^2 + 4a - 5) - (3a^2 + 2a + 1)$

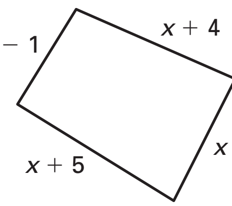
21. $(m^2 - 3m + 4) - (-m^2 + 5m + 1)$

Write a polynomial that represents the perimeter of the figure.

22.



23.

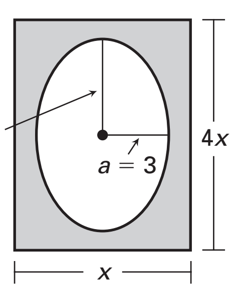


24. **Library Books** For 1997 through 2007, the number F of fiction books (in ten thousands) and the number N of nonfiction books (in ten thousands) borrowed from a library can be modeled by

$F = 0.01t^2 + 0.08t + 7$ and $N = 0.004t^2 + 0.05t + 5$

where t is the number of years since 1997. Write an equation for the total number B of fiction and nonfiction books borrowed from the library in a year from 1997 to 2007.

25. **Photograph Mat** A mat in a frame has an opening for a photograph as shown in the figure. Find the area of the mat if the area of the opening is given by $A = \pi ab$. Leave your answer in terms of π.



Not drawn to scale

2.2 Multiply Polynomials

Georgia Performance Standard(s)

MM1A2c, MM1A2g

Your Notes

Goal • Multiply polynomials.

VOCABULARY

Area model for polynomial arithmetic

Volume model for polynomial arithmetic

Example 1 ***Multiply a monomial and a polynomial***

Find the product $3x^3(2x^3 - x^2 - 7x - 3)$.

Solution

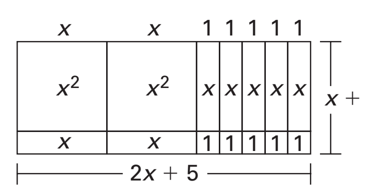
$3x^3(2x^3 - x^2 - 7x - 3)$

$= 3x^3($_____$) - 3x^3($____$) - 3x^3($____$) - 3x^3($___$)$

$=$ _____ $-$ _____ $-$ ______ $-$ _____

Example 2 ***Multiply polynomials using an area model***

Write a polynomial for the area of the model shown.



Solution

You know that the area of a rectangle is the product of its length and width. In the model, let _________ represent the length and let ________ represent the width. To find the total area of the model, ______ the areas of each rectangular part.

$A = \ell \times w =$ ____ + ____ + ___ + ___ + ___ + ___

+ ___ + ___ + ___ + ___ + ___

+ ___ + ___ + ___

$=$ _____ + ____ + ___

Your Notes

Checkpoint **Complete the following exercises.**

1. Find the product $(2x^2)(x^3 - 5x^2 + 3x - 7)$.

2. The dimensions of a rectangle are $4x + 1$ and $x + 2$. Draw an area model. Then write an expression for the area of the rectangle.

Example 3 ***Multiply polynomials horizontally***

Find the product $(3b^2 - 2b + 5)(5b - 6)$.

Solution

$(3b^2 - 2b + 5)(5b - 6)$

$= \_\_\_\_\_(5b - 6) - \_\_\_\_\_(5b - 6)$

$+ \_\_\_(5b - 6)$

$= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_$

$= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_$

Your Notes

Example 4 ***Multiply binomials***

Find the product $(2c + 7)(c - 9)$.

Solution

$(2c + 7)(c - 9)$

$= 2c(\_\_\_) + 2c(\_\_\_\_\_) + 7(\_\_\_) + 7(\_\_\_\_\_)$

$=$ ______________________________

$=$ __________________

Remember that the terms of $(c - 9)$ are c and -9. They are not c and 9.

✔ ***Checkpoint*** **Find the product.**

3. $(a^2 + 5a - 4)(2a + 3)$

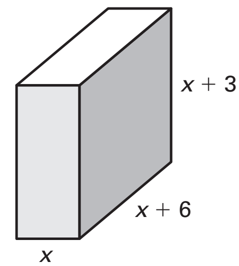
4. $(m + 3)(5m - 4)$

5. $(2k - 3)(7k - 8)$

Your Notes

Example 5 ***Multiply polynomials using a volume model***

Write a polynomial for the volume of the rectangular prism shown.



Solution

You know that the volume of a rectangular prism is the product of its ________, ________, and ________. In the figure shown, let ___ represent the length, let ________ represent the width, and let ________ represent the height.

Volume = length • width • height

= ___(________)(________)

= ___[___(___) + ___(___) + ___(___)
+ ___(___)]

= ___(____ + ____ + ____ + ____)

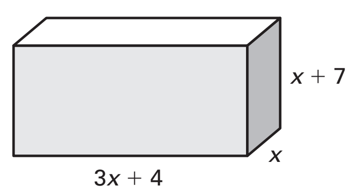
= ___(______________)

= ______________________

= _________________

✔ *Checkpoint* **Complete the following exercise.**

6. Write an expression for the volume of the prism shown.



Homework

Name ______________________ Date ______________

LESSON 2.2

Practice

Find the product.

1. $x(3x^2 - 2x + 1)$
2. $2y(3y^3 + y^2 - 4)$
3. $-3m(m^2 + 4m - 1)$
4. $d^2(4d^2 - 3d + 1)$
5. $-w^3(w^2 + 3w)$
6. $-a^2(a^2 + 3a - 1)$
7. $(4a + 1)(2a - 1)$
8. $(w + 1)(w^2 + 2w + 1)$
9. $(m - 2)(m^2 - 2m + 3)$
10. $(y - 3)(8y + 1)$
11. $(5b - 1)(3b + 2)$
12. $(2d - 4)(3d - 1)$
13. $(3x + 1)(2x + 2)$
14. $(6x - 2)(x + 4)$
15. $(2s - 5)(s + 3)$

Simplify the expression.

16. $p(p^3 + 2p) + (p - 3)(p + 5)$
17. $(x + 3)(x + 8) - x(2x + 4)$
18. $(r - 6)(r - 2) + (r + 4)(r - 9)$

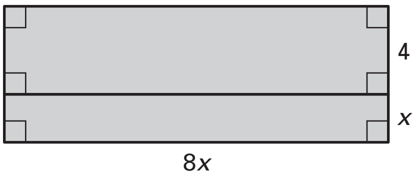
Name ______________________ Date ____________

LESSON 2.2

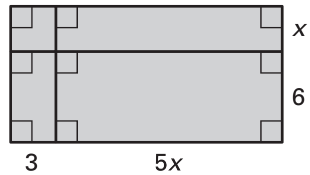
Practice *continued*

Write a polynomial for the area of the model.

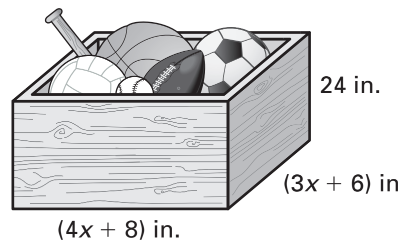
19.



20.



21. **Volume** You have come up with a plan for building a wooden box to hold all of your sports equipment as shown.



a. Write a polynomial that represents the volume of the box.

b. Find the volume of the box when $x = 10$.

22. **National Park System** During the period 1990–2002, the number A of acres (in thousands) making up the national park system in the United States and the percent P (in decimal form) of this amount that is parks can be modeled by

$A = 211t + 76{,}226$

and

$P = -0.0008t^2 + 0.009t + 0.6$

where t is the number of years since 1990.

a. Find the values of A and P for $t = 0$. What does the product $A \cdot P$ mean for $t = 0$ in the context of this problem?

b. Write an equation that models the number of acres (in thousands) that are just parks as a function of the number of years since 1990.

2.3 Find Special Products of Polynomials

Georgia Performance Standard(s)

MM1A2c

Goal • Use special product patterns to multiply binomials.

Your Notes

SQUARE OF A BINOMIAL PATTERN

Algebra

$(a + b)^2 = a^2$ ________ $+ b^2$

$(a - b)^2 = a^2$ ________ $+ b^2$

Example

$(x + 4)^2 = x^2$ _______ $+ 16$

$(3x - 2)^2 = 9x^2$ ________ $+ 4$

Example 1 ***Use the square of a binomial pattern***

Find the product.

Solution

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

$= 16x^2$ ________ $+ 9$

b. $(3x - 5y)^2 = (3x)^2$ _____________ $+ (5y)^2$

$= 9x^2$ _________ $+ 25y^2$

When you use special product patterns, remember that *a* and *b* can be numbers, variables, or variable expressions.

Checkpoint **Find the product.**

1. $(x + 9)^2$

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

3. $(5r + s)^2$

Your Notes

SUM AND DIFFERENCE PATTERN

Algebra

$(a + b)(a - b) = \_\_\_^2 - \_\_\_^2$

Example

$(x + 4)(x - 4) = \_\_\_^2 - \_\_\_\_$

Example 2 *Use the sum and difference pattern*

Find the product.

Solution

a. $(n + 3)(n - 3) = \_\_\_^2 - \_\_\_^2$ **Sum and difference pattern**

$= \_\_\_^2 - \_\_\_$ **Simplify.**

b. $(4x + y)(4x - y) = \_\_\_\_\_^2 - \_\_\_^2$ **Sum and difference pattern**

$= \_\_\_\_\_^2 - \_\_\_^2$ **Simplify.**

Example 3 *Use special products and mental math*

Use special products to find the product 17 • 23.

Solution

Notice that 17 is 3 less than ____ while 23 is 3 more than ____.

17 • 23 = (____ − 3)(____ + 3) **Write as product.**

= __________ **Sum and difference pattern**

= __________ **Evaluate powers.**

= _____ **Simplify.**

Your Notes

✔ ***Checkpoint*** **Complete the following exercises.**

4. Find the product $(z + 6)(z - 6)$.

5. Find the product $(4x + 3)(4x - 3)$.

6. Find the product $(x + 5y)(x - 5y)$.

7. *Describe* how you can use special products to find 39^2.

Homework

Name ______________________ Date ____________

LESSON 2.3

Practice

Find the missing term.

1. $(a - b)^2 = a^2 - \underline{\ ?\ } + b^2$

2. $(m + n)^2 = m^2 + \underline{\ ?\ } + n^2$

3. $(x - 1)^2 = x^2 - \underline{\ ?\ } + 1$

4. $(x + 5)^2 = x^2 + \underline{\ ?\ } + 25$

5. $(x - y)(x + y) = x^2 - \underline{\ ?\ }$

6. $(x - 3)(x + 3) = x^2 - \underline{\ ?\ }$

Match the product with its polynomial.

7. $(2x + 3)(2x - 3)$

8. $(2x + 3)^2$

9. $(2x - 3)^2$

A. $4x^2 + 12x + 9$

B. $4x^2 - 12x + 9$

C. $4x^2 - 9$

Find the product of the square of the binomial.

10. $(x + 4)^2$

11. $(m - 8)^2$

12. $(a + 10)^2$

13. $(p - 12)^2$

14. $(2y + 1)^2$

15. $(3y - 1)^2$

16. $(10r - 1)^2$

17. $(4n + 2)^2$

18. $(3c - 2)^2$

Find the product of the sum and difference.

19. $(z + 5)(z - 5)$

20. $(b - 2)(b + 2)$

21. $(n - 8)(n + 8)$

Name ______________________ Date ____________

LESSON 2.3

Practice *continued*

22. $(a + 10)(a - 10)$

23. $(2x + 1)(2x - 1)$

24. $(5m - 1)(5m + 1)$

25. $(4d + 1)(4d - 1)$

26. $(3p + 2)(3p - 2)$

27. $(2r - 3)(2r + 3)$

Describe **how you can use mental math to find the product.**

28. $13 \cdot 7$

29. $24 \cdot 36$

30. $51 \cdot 69$

31. **Total Profit** For 1997 through 2007, the number N of units (in thousands) produced by a manufacturing plant can be modeled by $N = 3t + 2$ and the profit per unit P (in dollars) can be modeled by $P = 3t - 2$ where t is the number of years since 1997. Write a polynomial that models the total profit T (in thousands of dollars).

32. **Eye Color** In humans, the brown eye gene B is dominant and the blue eye gene b is recessive. This means that humans whose eye genes are BB, Bb, or bB have brown eyes and those with bb have blue eyes. The Punnett square at the right shows the results of eye colors for children of parents who each have one B gene and one b gene.

Mother

Father	*B*	*b*
B	*BB*	*Bb*
b	*bB*	*bb*

a. Write a polynomial that models the percent of possible gene combinations of a child.

b. What percent of the possible gene combinations results in a child with blue eyes?

2.4 Use the Binomial Theorem

Georgia Performance Standard(s)

MM1A2d

Your Notes

Goal • Use the Binomial Theorem to expand binomials.

VOCABULARY

Pascal's triangle

Pascal's Triangle

				1					$n = 0$ (0th row)
			1		1				$n = 1$ (1st row)
		1		___		1			$n = 2$ (2nd row)
	1		___		___		1		$n = 3$ (3rd row)
1		___		___		___		1	$n = 4$ (4th row)

The first and last numbers in each row are ___. Beginning with the second row, every other number is formed by ________ the two numbers immediately above the number.

Binomial expansion

$(a + b)^0 = 1$

$(a + b)^1 = 1a + 1b$

$(a + b)^2 = 1a^2 +$ _____ $+ 1b^2$

$(a + b)^3 = 1a^3 +$ ______ $+$ ______ $+ 1b^3$

$(a + b)^4 = 1a^4 +$ ______ $+$ _______ $+$ ______ $+ 1b^4$

Your Notes

Example 1 *Use Pascal's triangle*

Use the fourth row of Pascal's triangle to find the numbers in the fifth and sixth rows of Pascal's triangle.

Solution

Write the fifth row of Pascal's triangle by adding numbers from the ________ row. Write the sixth row of Pascal's triangle by adding numbers from the ______ row.

n = 4 (4th row) 1 4 6 4 1

n = 5 (5th row) 1 ___ ___ ___ ___ 1

n = 6 (6th row) 1 ___ ___ ___ ___ ___ 1

✔ ***Checkpoint*** **Complete the following exercise.**

1. Find the numbers in the eighth row of Pascal's triangle.

Example 2 *Expand a power of a binomial sum*

Use the Binomial Theorem and Pascal's triangle to write the binomial expansion of $(x + 5)^4$.

Solution

The binomial coefficients from the fourth row of Pascal's triangle are ___, ___, ___, ___, and ___. So, the expansion is as follows.

$(x + 5)^4 =$ ___(x^4) + ___$(x^3)(5)$ + ___$(x^2)(5)^2$

+ ___$(x)(5)^3$ + ___$(5)^4$

= ______________________________

Your Notes

✔ ***Checkpoint*** **Use the Binomial Theorem and Pascal's triangle to write the binomial expansion.**

2. $(x + 3)^5$

3. $(4 + y)^4$

Example 3 ***Expand a power of a binomial difference***

Use the Binomial Theorem and Pascal's triangle to write the binomial expansion of $(x - 6)^3$.

Solution

The binomial coefficients from the third row of Pascal's triangle are ______________. So, the expansion is as follows.

$(x - 6)^3 = [x + (\_\_\_\_)]^3$

$= \_\_\_(\_\_\_)^3 + \_\_\_(\_\_\_)^2(\_\_\_\_)$

$+ \_\_\_(\_\_\_)(\_\_\_\_)^2 + \_\_\_(\_\_\_\_)^3$

$=$ ________________________

✔ ***Checkpoint*** **Use the Binomial Theorem and Pascal's triangle to write the binomial expansion.**

4. $(x - 7)^4$

5. $(5 - a)^3$

Your Notes

Example 4 *Expand a power of a binomial sum*

Use the Binomial Theorem and Pascal's triangle to write the binomial expansion of $(5 + 2x)^4$.

Solution

The binomial coefficients from the fourth row of Pascal's triangle are ________________. So, the expansion is as follows.

$(5 + 2x)^4 = $ ___(___)^4 + ___(___)^3(____)

+ ___(___)^2(____)^2 + ___(___)(____)^3

+ ___(____)^4

= ______________________________________

Checkpoint **Use the Binomial Theorem and Pascal's triangle to write the binomial expansion.**

6. $(8 - 5y)^4$

Example 5 *Find a coefficient in an expansion*

Find the coefficient of x^3 in $(4x + 3)^4$.

Solution

The binomial coefficients from the fourth row of Pascal's triangle are ________________. So, the expansion is as follows.

$(4x + 3)^4 = $ ___(____)^4 + ___(____)^3 (___)

+ ___(____)^2(___)^2 + ___(____)(___)^3

+ ___(___)^4

The coefficient of the x^3-term is (___)(___)^3(___) = _____.

Homework

Checkpoint **Complete the following exercise.**

7. Find the coefficient of x^2 in the expansion of $(7 - x)^5$.

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LESSON 2.4

Practice

1. Find the numbers in the tenth row of Pascal's triangle.

Use the Binomial Theorem and Pascal's triangle to write the binomial expansion.

2. $(x + 6)^3$

3. $(4 + m)^5$

4. $(y + 2)^4$

5. $(k + 1)^6$

6. $(5 + w)^4$

7. $(8 + j)^3$

8. $(a - 3)^2$

9. $(6 - r)^4$

10. $(10 - s)^3$

11. $(c - 8)^4$

12. $(2 - z)^5$

13. $(p - 5)^3$

Name ______________________ Date ______________

LESSON 2.4

Practice *continued*

14. $(3x - 4)^3$

15. $(5 + 2y)^4$

16. $(2k + 7)^3$

17. $(8 - 5n)^5$

18. $(4u + v)^3$

19. $(c - 4d)^4$

20. Find the coefficient of x^2 in the expansion of $(x + 3)^4$.

21. Find the coefficient of x^3 in the expansion of $(2x - 9)^5$.

22. Find the coefficient of x^4 in the expansion of $(5x + 4)^6$.

23. **Error Analysis** *Describe* and correct the error in writing the binomial expansion.

$(3 + 2y)^3 = 27 + 27y + 9y^2 + y^3$ X

2.5 Solve Polynomial Equations in Factored Form

Georgia Performance Standard(s)

MM1A2f

Your Notes

Goal • Solve polynomial equations.

VOCABULARY

Roots

Vertical motion model

ZERO-PRODUCT PROPERTY

Let a and b be real numbers. If $ab = 0$, then ___ = 0 or ___ = 0.

Example 1 ***Use the zero-product property***

Solve $(x - 5)(x + 4) = 0$.

Solution

$(x - 5)(x + 4) = 0$	**Write original equation.**
_______ = 0 *or* _______ = 0	_______________ **property**
$x =$ ___ *or* $x =$ _____	**Solve for x.**

The solutions of the equation are ___________.

CHECK Substitute each solution into the original equation to check.

(___ − 5)(___ + 4) $\stackrel{?}{=}$ 0   (_____ − 5)(_____ + 4) $\stackrel{?}{=}$ 0

_______ $\stackrel{?}{=}$ 0   _________ $\stackrel{?}{=}$ 0

___ = 0   ___ = 0

Your Notes

Checkpoint Solve the equation.

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

2. $(x - 8)(x - 5) = 0$

Example 2 *Solve an equation by factoring*

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

Solution

$3x^2 + 15x = 0$	Write original equation.
______ $= 0$	Factor left side.
____ $= 0$ *or* ______ $= 0$	Zero-product property
$x =$ ___ *or* $x =$ ____	Solve for x.

The solutions of the equation are ________.

Example 3 *Solve an equation by factoring*

Solve $9b^2 = 24b$.

Solution

To use the zero-product property, you must write the equation so that one side is 0. For this reason, ______ must be subtracted from each side of the equation.

$9b^2 = 24b$	Write original equation.
______ $= 0$	Subtract _____ from each side.
______ $= 0$	Factor left side.
____ $= 0$ *or* ______ $= 0$	Zero-product property
$b =$ ___ *or* $b =$ ___	Solve for b.

The solutions of the equation are ________.

Your Notes

Example 4 ***Solve a multi-step problem***

Fountain A fountain sprays water from the ground into the air with an initial vertical velocity of 20 feet per second. After how many seconds does it land on the ground?

Solution

Step 1 **Write** a model for the water's height above ground.

$h = -16t^2 + vt + s$ — **Vertical motion model**

$h = -16t^2 +$ ____ $t +$ ___ — **$v =$ ____ and $s =$ ___**

$h = -16t^2 +$ ____ — **Simplify.**

Step 2 **Substitute** ___ for h. When the water lands, its height above the ground is ___ feet. Solve for t.

___ $= -16t^2 +$ ____ — **Substitute ___ for h.**

___ $=$ __________ — **Factor right side.**

_______ *or* __________ — **Zero-product property**

______ *or* ________ — **Solve for t.**

The water lands on the ground _____ seconds after it is sprayed.

The solution $t = 0$ means that before the water is sprayed, its height above the ground is 0 feet.

Checkpoint **Complete the following exercises.**

3. Solve $d^2 - 7d = 0$.

4. Solve $8b^2 = 2b$.

5. In Example 4, suppose the initial vertical velocity is 18 feet per second. After how many seconds does the water land on the ground?

Homework

Name ______________________ Date ______________

LESSON 2.5

Practice

Match the equation with its solutions.

1. $(x + 4)(x + 5) = 0$

2. $(x - 4)(x + 5) = 0$

3. $(x - 5)(x - 4) = 0$

A. -5 and 4

B. -5 and -4

C. 4 and 5

Solve the equation.

4. $(x + 6)(x + 2) = 0$

5. $(p - 5)(p + 3) = 0$

6. $(b - 7)(b - 10) = 0$

7. $(m - 8)(m + 1) = 0$

8. $(a - 9)(a + 9) = 0$

9. $(y + 15)(y + 12) = 0$

10. $(c - 25)(c + 50) = 0$

11. $(2z - 2)(z + 3) = 0$

12. $(2n - 6)(n - 2) = 0$

Match the equation with its solutions.

13. $4a^2 + a = 0$

14. $a^2 + 4a = 0$

15. $a^2 - 4a = 0$

A. 0 and 4

B. 0 and -4

C. 0 and $-\frac{1}{4}$

Name ______________________ Date ______________

LESSON 2.5

Practice *continued*

Solve the equation.

16. $a^2 + 8a = 0$

17. $n^2 - 7n = 0$

18. $2w^2 + 2w = 0$

19. $3p^2 - 3p = 0$

20. $4c^2 - 8c = 0$

21. $5x^2 + 10x = 0$

22. $15m^2 = -3m$

23. $24r^2 = 42r$

24. $-8k^2 = 32k$

25. **Hot Air Balloon** An object is dropped from a hot-air balloon 1296 feet above the ground. The height of the object is given by

$h = -16(t - 9)(t + 9)$

where the height h is measured in feet, and the time t is measured in seconds. After how many seconds will the object hit the ground?

26. **Kickball** A kickball is kicked upward with an initial vertical velocity of 3.2 meters per second. The height of the ball is given by

$h = -9.8t^2 + 3.2t$

where the height h is measured in feet, and the time t is measured in seconds. After how many seconds does the ball land?

2.6 Factor $x^2 + bx + c$

Georgia Performance Standard(s)

MM1A2f, MM1A3a, MM1A3c

Your Notes

Goal • Factor trinomials of the form $x^2 + bx + c$.

FACTORING $x^2 + bx + c$

Algebra

$x^2 + bx + c = (x + p)(x + q)$ provided _______ $= b$ and _____ $= c$.

Example

$x^2 + 6x + 5 =$ (_______)(_______) because _______ $= 6$ and ______ $= 5$.

Example 1 ***Factor when b and c are positive***

Factor $x^2 + 10x + 16$.

Solution

Find two _________ factors of ____ whose sum is ____. Make an organized list.

Factors of ____	Sum of factors
16, ___	16 + ___ = ____
8, ___	8 + ___ = ____
4, ___	4 + ___ = ___

The factors 8 and ___ have a sum of ____, so they are the correct values of p and q.

$x^2 + 10x + 16 = (x + 8)$(_______)

CHECK

$(x + 8)$(_______) = ____________________ **Multiply.**

= ________________ **Simplify.**

Your Notes

Example 2 ***Factor when b is negative and c is positive***

Factor $a^2 - 5a + 6$.

Solution

Because b is negative and c is positive, p and q must ______________.

Factors of ___	Sum of factors
__________	_____ + (_____) = _____
__________	_____ + (_____) = _____

$a^2 - 5a + 6 = (\_\_\_\_\_\_\_)(\_\_\_\_\_\_\_)$

Example 3 ***Factor when b is positive and c is negative***

Factor $y^2 + 3y - 10$.

Solution

Because c is negative, p and q must ________________ ______.

Factors of ______	Sum of factors
−10, ___	−10 + ___ = _____
10, _____	10 + _______ = ___
−5, ___	−5 + ___ = _____
5, _____	5 + _______ = ___

$y^2 + 3y - 10 = (\_\_\_\_\_\_\_)(\_\_\_\_\_\_\_)$

✔ ***Checkpoint*** **Factor the trinomial.**

1. $x + 7x + 12$	**2.** $x + 9x + 8$

Your Notes

Checkpoint Factor the trinomial.

3. $x^2 - 12x + 27$	**4.** $x^2 - 9x + 20$
5. $y^2 + 4y - 21$	**6.** $z^2 + 2z - 24$

Example 4 *Solve a polynomial equation*

Solve the equation $x^2 + 7x = 18$.

$x^2 + 7x = 18$	Write original equation.
$x^2 + 7x -$ ____ $= 0$	Subtract ____ from each side.
____________ $= 0$	Factor left side.
__________ *or* __________	Zero-product property
________ *or* ________	Solve for x.

The solutions of the equation are __________.

Homework

Checkpoint Complete the following exercise.

7. Solve the equation $s^2 - 12s = 13$.

Name ______________________________ Date ______________

LESSON 2.6

Practice

Match the trinomial with its correct factorization.

1. $x^2 - 4x - 12$

2. $x^2 - x - 12$

3. $x^2 + 4x - 12$

A. $(x + 6)(x - 2)$

B. $(x - 6)(x + 2)$

C. $(x + 3)(x - 4)$

Factor the trinomial.

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

5. $a^2 + 10a + 21$

6. $w^2 + 8w + 15$

7. $p^2 - 3p - 10$

8. $c^2 + 10c - 11$

9. $y^2 + 5y - 14$

10. $n^2 - 4n + 3$

11. $b^2 - 5b + 6$

12. $r^2 - 12r + 35$

13. $z^2 + 7z + 12$

14. $s^2 - 3s - 18$

15. $d^2 - 5d - 24$

Solve the equation.

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

17. $d^2 + 7d + 10 = 0$

18. $p^2 + 9p + 14 = 0$

19. $w^2 - 12w + 11 = 0$

20. $n^2 - n - 6 = 0$

21. $a^2 - 12a + 35 = 0$

Name ______________________ Date ______________

LESSON 2.6

Practice *continued*

22. $y^2 - 4y - 5 = 0$

23. $m^2 + 2m - 15 = 0$

24. $b^2 + 6b - 7 = 0$

25. $w(w + 1) = 12$

26. $x(x - 3) = 10$

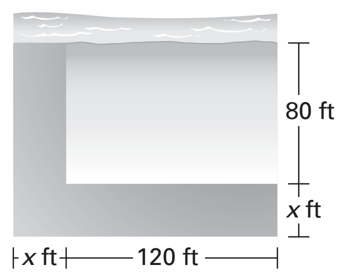
27. $m(m - 5) = 6$

28. $b(b + 4) = 21$

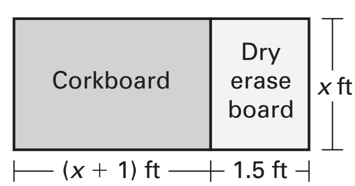
29. $p(p + 5) = 36$

30. $r(r - 3) = 4$

31. **Boardwalk** A boardwalk is being built along two sides of a beach area. The beach area is rectangular with a width of 80 feet and a length of 120 feet. The boardwalk will have the same width on each side of the beach area. If the combined area of the beach and the boardwalk is 16,500 square feet, then the area can be modeled by $(x + 80)(x + 120) = 16,500$. How wide should the boardwalk be?



32. **Note Board Design** You are designing a note board that is made of corkboard and dry erase board. The area of the corkboard is 6 square feet.



a. Write an equation for the area of the corkboard.

b. Find the dimensions of the corkboard.

c. Find the area of the dry erase board.

2.7 Factor $ax^2 + bx + c$

Georgia Performance Standard(s)

MM1A2f

Your Notes

Goal • Factor trinomials of the form $ax^2 + bx + c$.

Example 1 ***Factor when b is negative and c is positive***

Factor $2x^2 - 11x + 5$.

Solution

Because b is negative and c is positive, both factors of c must be __________. You must consider the _______ of the factors of 5, because the x-terms of the possible factorizations are different.

Factors of 2	Factors of 5	Possible factorization	Middle term when multiplied
1, 2	−1, _____	$(x - 1)(2x$_____$)$	_______ $- 2x =$ _______
1, 2	−5, _____	$(x - 5)(2x$_____$)$	______ $- 10x =$ _______

$2x^2 - 11x + 5 = (x -$ ___$)(2x$_____$)$

Example 2 ***Factor when b is positive and c is negative***

Factor $5n^2 + 2n - 3$.

Solution

Because b is positive and c is negative, the factors of c have _______________.

Factors of 5	Factors of −3	Possible factorization	Middle term when multiplied
1, 5	1, _____	$(n + 1)(5n$_____$)$	____________________
1, 5	−1, ___	$(n - 1)(5n$_____$)$	____________________
1, 5	3, _____	$(n + 3)(5n$_____$)$	____________________
1, 5	−3, ___	$(n - 3)(5n$_____$)$	____________________

$5n^2 + 2n - 3 = (n$_____$)(5n$_____$)$

Your Notes

Checkpoint Factor the trinomial.

1. $3x^2 - 5x + 2$	**2.** $2m^2 + m - 21$

Example 3 *Factor when a is negative*

Factor $-4x^2 + 4x + 3$.

Solution

Step 1 Factor _____ from each term of the trinomial.

$-4x^2 + 4x + 3 =$ ____(________________)

Step 2 Factor the trinomial ________________. Because c is ___________, the factors of c must have ________________.

Factors of 4	Factors of −3	Possible factorization	Middle term when multiplied
1, 4	1, _____	$(x + 1)(4x$_____$)$	____________________
1, 4	3, _____	$(x + 3)(4x$_____$)$	____________________
1, 4	−1, ____	$(x - 1)(4x$_____$)$	____________________
1, 4	−3, ____	$(x - 3)(4x$_____$)$	____________________
2, 2	1, _____	$(2x + 1)(2x$_____$)$	____________________
2, 2	−1, ____	$(2x - 1)(2x$_____$)$	____________________

Remember to include the ______ that you factored out in Step 1.

$-4x^2 + 4x + 3 =$ ____________________

Homework

Checkpoint Complete the following exercise.

3. Factor $-2y^2 - 11y - 5$.

Name ______________________ Date ______________

LESSON 2.7

Practice

Match the trinomial with its correct factorization.

1. $4x^2 - 2x - 2$

2. $4x^2 - 7x - 2$

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

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

B. $(2x + 1)(2x - 2)$

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

Factor the trinomial.

4. $-x^2 - 2x + 15$

5. $-m^2 + 3m - 2$

6. $-p^2 + 5p + 14$

7. $2w^2 + 7w + 3$

8. $3y^2 + 5y + 2$

9. $2b^2 + b - 1$

10. $3n^2 - 3$

11. $5a^2 + 13a - 6$

12. $2z^2 + 9z - 5$

13. $7d^2 - 15d + 2$

14. $2r^2 - 12r + 10$

15. $6s^2 - 13s + 2$

Solve the equation.

16. $2x^2 + 7x - 15 = 0$

17. $3n^2 + 13n + 4 = 0$

18. $4b^2 + 2b - 2 = 0$

19. $2m^2 + 5m - 3 = 0$

20. $3p^2 + 11p - 4 = 0$

21. $3y^2 + 11y + 10 = 0$

22. $4r^2 + 8r + 3 = 0$

23. $9w^2 + 3w - 2 = 0$

24. $5a^2 - 8a - 4 = 0$

Name ______________________ Date ______________

LESSON 2.7

Practice *continued*

25. $3c^2 + 19c - 14 = 0$

26. $8z^2 + 6z + 1 = 0$

27. $12d^2 + 14d - 6 = 0$

Find the zeros of the polynomial function.

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

29. $g(x) = 3x^2 - 13x - 10$

30. $h(x) = -2x^2 + 9x + 5$

31. $g(x) = -x^2 + 5x - 6$

32. $f(x) = 4x^2 - 9x + 2$

33. $g(x) = -2x^2 - 9x + 18$

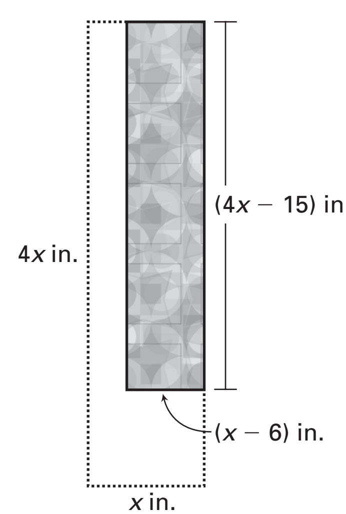
34. $h(x) = 2x^2 + 7x - 4$

35. $h(x) = 6x^2 + 3x - 9$

36. $f(x) = -4x^2 - 9x - 2$

37. **Ball Toss** A ball is tossed into the air from a height of 8 feet with an initial velocity of 8 feet per second. Find the time t (in seconds) it takes for the object to reach the ground by solving the equation $-16t^2 + 8t + 8 = 0$.

38. **Wallpaper** You trimmed a large strip of wallpaper from a scrap to fit into the corner of a wall you are wallpapering. You trimmed 15 inches from the length and 6 inches from the width. The area of the resulting strip of wallpaper is 684 square inches.



a. If the length of the original strip of wallpaper is four times the original width, write a polynomial that represents the area of the trimmed strip of wallpaper.

b. What are the dimensions of the original scrap of wallpaper?

2.8 Factor Special Products

Georgia Performance Standard(s)

MM1A2f

Your Notes

Goal • Factor special products.

DIFFERENCE OF TWO SQUARES PATTERN

Algebra

$a^2 - b^2 = (a + b)(\_\_\_\_\_\_\_\_)$

Example

$9x^2 - 4 = (3x)^2 - 2^2 = (\_\_\_\_\_\_\_\_)(\_\_\_\_\_\_\_\_)$

Example 1 *Factor the differences of two squares*

Factor the polynomial.

a. $z^2 - 81 = z^2 - \_\_\_^2$

$= (z + \_\_\_)(z - \_\_\_)$

b. $16x^2 - 9 = (\_\_\_\_)^2 - \_\_\_^2$

$= (\_\_\_\_ + \_\_\_)(\_\_\_\_ - \_\_\_)$

c. $a^2 - 25b^2 = a^2 - (\_\_\_\_)^2$

$= (a + \_\_\_\_)(a - \_\_\_\_)$

d. $4 - 16n^2 = \_\_\_(\_\_\_ - \_\_\_\_\_)$

$= \_\_\_[(\_\_\_)^2 - (\_\_\_\_)^2]$

$= \_\_\_(\_\_\_ + \_\_\_\_)(\_\_\_ - \_\_\_\_)$

✓ ***Checkpoint*** **Factor the polynomial.**

1. $x^2 - 100$	**2.** $49y^2 - 25$
3. $c^2 - 9d^2$	**4.** $45 - 80m^2$

Your Notes

PERFECT SQUARE TRINOMIAL PATTERN

Algebra

$a^2 + 2ab + b^2 = (\_\_\_\_\_\_\_)^2$

$a^2 - 2ab + b^2 = (\_\_\_\_\_\_\_)^2$

Example

$x^2 + 8x + 16 = x^2 + 2(x \cdot 4) + 4^2 = (\_\_\_\_\_\_\_)^2$

$x^2 - 6x + 9 = x^2 - 2(x \cdot 3) + 3^2 = (\_\_\_\_\_\_\_)^2$

Example 2 *Factor perfect square trinomials*

Factor the polynomial.

a. $x^2 - 10x + 25 = x^2 - 2(\_\_\_)(\_\_\_) + \_\_\_^2$
$= (\_\_\_\_\_\_\_)^2$

b. $y^2 + 12y + 36 = y^2 + 2(\_\_\_)(\_\_\_) + \_\_\_^2$
$= (\_\_\_\_\_\_\_)^2$

Checkpoint **Factor the polynomial.**

5. $x^2 + 14x + 49$	**6.** $t^2 - 22t + 121$

Example 3 *Factor perfect square trinomials*

Factor the polynomial.

a. $4y^2 - 12y + 9 = (\_\_\_\_)^2 - 2(\_\_\_\_\_\_\_\_) + \_\_\_\_^2$
$= (\_\_\_\_\_\_\_\_)^2$

b. $-3z^2 + 24z - 48 = \_\_\_\_\_(z^2 - 8z + 16)$
$= \_\_\_\_\_[z^2 - 2(\_\_\_\_\_\_) + \_\_\_^2]$
$= \_\_\_\_\_(\_\_\_\_\_\_\_)^2$

c. $49s^2 + 56st + 16t^2 = (\_\_\_\_)^2 + 2(\_\_\_\_\_\_\_\_) + \_\_\_\_^2$
$= (\_\_\_\_\_\_\_\_)^2$

Your Notes

Checkpoint Factor the polynomial.

7. $16x^2 - 40xy + 25y^2$	**8.** $-5r^2 - 20r - 20$

Example 4 *Solve a polynomial equation*

Solve the equation $x^2 + x + \frac{1}{4} = 0$.

$x^2 + x + \frac{1}{4} = 0$	Write original equation.
______________ $= 0$	Multiply each side by ____.
______________________ $= 0$	Write left side as $a^2 + 2ab + b^2$.
__________ $= 0$	Perfect square trinomial pattern
_________ $= 0$	Zero-product property
$x =$ _____	Solve for x.

This equation has two identical solutions, because it has two identical factors.

Checkpoint Solve the equation.

9. $m^2 - 8m + 16 = 0$

10. $t^2 - 121 = 0$

Homework

Name ______________________ Date ______________

LESSON 2.8
Practice

Match the trinomial with its correct factorization.

1. $x^2 - 25$

2. $x^2 + 10x + 25$

3. $x^2 - 10x + 25$

A. $(x + 5)^2$

B. $(x - 5)(x + 5)$

C. $(x - 5)^2$

Factor the difference of two squares.

4. $x^2 - 1$

5. $b^2 - 81$

6. $m^2 - 100$

7. $p^2 - 225$

8. $4y^2 - 1$

9. $16n^2 - 25$

10. $4r^2 - 121$

11. $9s^2 - 144$

12. $c^2 - 625$

Factor the perfect square trinomial.

13. $x^2 + 6x + 9$

14. $b^2 + 10b + 25$

15. $w^2 - 12w + 36$

16. $m^2 - 8m + 16$

17. $r^2 - 20r + 100$

18. $z^2 + 16z + 64$

19. $s^2 + 22s + 121$

20. $x^2 - 16x + 64$

21. $4c^2 + 4c + 1$

22. $16d^2 + 8d + 1$

23. $9y^2 - 6y + 1$

24. $9p^2 - 12p + 4$

25. $4m^2 + 28mn + 49n^2$

26. $100x^2 - 60xy + 9y^2$

27. $\frac{1}{4}a^2 + \frac{1}{9}ab + \frac{1}{81}b^2$

Solve the equation.

28. $x^2 - 9 = 0$

29. $p^2 + 14p + 49 = 0$

30. $d^2 - 10d + 25 = 0$

Name ______________________ Date ______________

LESSON 2.8

Practice *continued*

31. $25m^2 - 1 = 0$

32. $r^2 - 2r + 1 = 0$

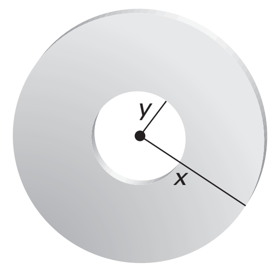
33. $n^2 + 20n + 100 = 0$

34. $4y^2 - 9 = 0$

35. $36x^2 - 64 = 0$

36. $w^2 + 4w + 4 = 0$

37. Washers Washers are available in many different sizes.



a. Write and factor an expression for the area of one side of the washer. Leave your answer in terms of π.

b. Find the area of one side of the washer when $x = 8$ centimeters and $y = 3$ centimeters.

38. Cherry Tree A cherry falls from a tree branch that is 9 feet above the ground.

a. How far above the ground is the cherry after 0.2 second?

b. After how many seconds does the cherry reach the ground?

39. Wind Chime A wind chime falls from a roof that is 25 feet above the ground.

a. How far above the ground is the wind chime after 0.5 second?

b. After how many seconds does the wind chime reach the ground?

2.9 Factor Polynomials Completely

Georgia Performance Standard(s)

MM1A2f

Goal • Factor polynomials completely.

Your Notes

VOCABULARY

Factor by grouping

Factor completely

Example 1 ***Factor out common binomial***

Factor the expression.

a. $3x(x + 2) - 2(x + 2)$ **b.** $y^2(y - 4) + 3(4 - y)$

Solution

a. $3x(x + 2) - 2(x + 2) = (x + 2)($________$)$

b. The binomials $y - 4$ and $4 - y$ are __________. Factor ____ from $4 - y$ to obtain a common binomial factor.

$y^2(y - 4) + 3(4 - y) = y^2(y - 4)$__________

$= (y - 4)$________

Example 2 ***Factor by grouping***

Factor the polynomial.

a. $y^3 + 7y^2 + 2y + 14$ **b.** $y^2 + 2y + yx + 2x$

Solution

a. $y^3 + 7y^2 + 2y + 14 = ($_________$) + ($_________$)$

$=$ ___$($_______$) +$ ___$($_______$)$

$= ($_______$)($_______$)$

b. $y^2 + 2y + yx + 2x = ($_________$) + ($_________$)$

$=$ ___$($_______$) +$ ___$($_______$)$

$= ($_______$)($_______$)$

Remember that you can check a factorization by multiplying the factors.

Your Notes

Rearrange the terms so that you can group terms within a common factor.

Example 3 *Factor by grouping*

Factor $x^3 - 12 + 3x - 4x^2$.

Solution

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

$=$ ____________________

$=$ ____________________

$=$ ____________________

✔ ***Checkpoint*** **Factor the expression.**

1. $5z(z - 6) + 4(z - 6)$	**2.** $2y^2(y - 1) + 7(1 - y)$
3. $x^3 - 4x^2 + 5x - 20$	**4.** $n^3 + 48 + 6n + 8n^2$

Example 4 *Factor completely*

Factor the polynomial completely.

a. $x^2 + 3x - 1$

b. $3r^3 - 21r^2 + 30r$

c. $9d^4 - 4d^2$

Solution

a. This polynomial ________ be factored.

b. $3r^3 - 21r^2 + 30r =$ ____________________

$=$ ____________________

c. $9d^4 - 4d^2 =$ ____________________

$=$ ____________________

Your Notes

Checkpoint Factor the expression.

5. $-2x^3 + 6x^2 + 108x$	6. $12y^4 - 75y^2$

Example 5 *Solve a polynomial equation*

Solve $5x^3 - 25x^2 = -30x$.

Solution

$5x^3 - 25x^2 = -30x$ — **Write original equation.**

$5x^3 - 25x^2$ ____ $30x = 0$ — **______ 30x to each side.**

________________ $= 0$ — **Factor out ____.**

________________ $= 0$ — **Factor trinomial.**

________ *or* __________ *or* __________ — **Zero-product property**

$x =$ ___ $x =$ ___ $x =$ ___ — **Solve for *x*.**

Remember that you can check your answers by substituting each solution for *x* in the original equation.

Checkpoint Solve the equation.

7. $2x^3 + 2x^2 = 40x$	8. $-4x^3 + 72x = -12x^2$

Homework

Name ______________________ Date ____________

LESSON 2.9

Practice

Match the trinomial with its correct factorization.

1. $2x(x + 5) - (x + 5)$

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

3. $2x(x - 5) - (x - 5)$

A. $(2x + 1)(x + 5)$

B. $(2x - 1)(x - 5)$

C. $(2x - 1)(x + 5)$

Factor the expression.

4. $x(x + 4) + (x + 4)$

5. $b(b + 3) - (b + 3)$

6. $2m(m + 1) + (m + 1)$

7. $5r(r + 2) - (r + 2)$

8. $w(w + 6) + 3(w + 6)$

9. $y(y + 4) - 6(y + 4)$

10. $n(n - 3) - 7(n - 3)$

11. $3z(z - 4) + 8(z - 4)$

12. $2p(p + 5) - 3(p + 5)$

Factor the polynomial by grouping.

13. $x^2 + x + 3x + 3$

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

15. $x^2 + 8x - x - 8$

16. $x^3 - 5x^2 + 2x - 10$

17. $x^3 - 4x^2 - 6x + 24$

18. $x^3 + 3x^2 + 5x + 15$

19. $x^3 - x^2 + 7x - 7$

20. $x^3 + 3x^2 - 3x - 9$

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

Determine whether the polynomial has been completely factored.

22. $x^4 + x^3$

23. $x^2 + 1$

24. $2x^2 + 4$

Name ______________________ Date ______________

LESSON 2.9

Practice *continued*

Factor the polynomial completely.

25. $x^5 - x^3$

26. $4a^4 - 25a^2$

27. $5y^6 - 125y^4$

Solve the equation.

28. $x^3 + x^2 - 25x - 25 = 0$

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

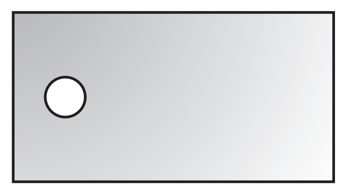
30. $x^3 - x^2 - 4x + 4 = 0$

31. $x^3 - x^2 - 9x + 9 = 0$

32. $z^3 - 4z = 0$

33. $c^4 - 64c^2 = 0$

34. **Metal Plate** You have a metal plate that you have drilled a hole into. The entire area enclosed by the metal plate is given by $5x^2 + 12x + 10$ and the area of the hole is given by $x^2 + 2$. Write an expression for the area in factored form of the plate that is left after the hole is drilled.



35. **Storage Container** A plastic storage container in the shape of a cylinder has a height of 8 inches and a volume of 72π cubic inches.

a. Write an equation for the volume of the storage container.

b. What is the radius of the storage container?

36. **Tennis Ball** For a science experiment, you toss a tennis ball from a height of 32 feet with an initial upward velocity of 16 feet per second. How long will it take the tennis ball to reach the ground?

2.10 Graph $y = ax^2 + c$

Georgia Performance Standard(s)

MM1A1b, MM1A1c, MM1A1e

Your Notes

Goal • Graph the simple quadratic functions.

VOCABULARY

Quadratic function

Parabola

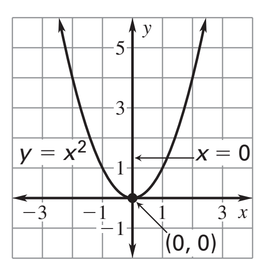
Parent quadratic function

Vertex

Axis of Symmetry

PARENT QUADRATIC FUNCTION

The most basic quadratic function in the family of quadratic functions, called the ________________ ________, is $y = x^2$. The graph is shown below.



The line that passes through the vertex and divides the parabola into two symmetric parts is called the ________ __________. The axis of symmetry for the graph of $y = x^2$ is the y-axis, _______.

The lowest or highest point on the parabola is the ________. The vertex of the graph of $y = x^2$ is (___, ___).

Your Notes

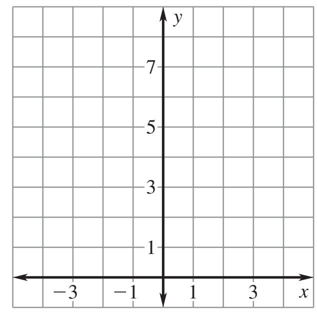
Example 1 ***Graph $y = ax^2$***

Graph $y = \frac{1}{2}x^2$. Compare the graph with the graph of $y = x^2$.

Solution

Step 1 Make a table of values for $y = \frac{1}{2}x^2$.

x	−4	−2	0	2	4
y	___	___	___	___	___



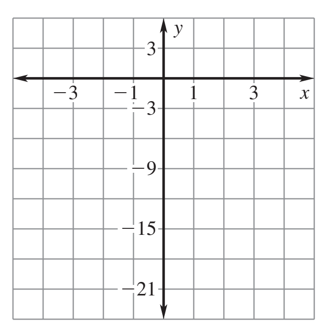
Step 2 ______ the points from the table.

Step 3 Draw a ________________ through the points.

Step 4 Compare the graphs of $y = \frac{1}{2}x^2$ and $y = x^2$. Both graphs have the same vertex, (___, ___), and axis of symmetry, ________. However, the graph of $y = \frac{1}{2}x^2$ is ________ than the graph of $y = x^2$. This is because the graph of $y = \frac{1}{2}x^2$ is a vertical ________ (by a factor of ___) of the graph of $y = x^2$.

Checkpoint **Graph the function. Compare the graph with the graph of $y = x^2$.**

1. $y = -5x^2$

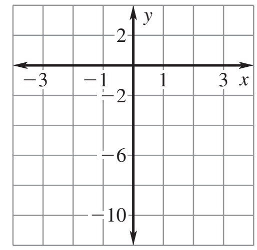


Your Notes

Example 2 *Graph $y = ax^2 + c$*

Graph $y = -3x^2 + 3$. Compare the graph with the graph of $y = x^2$.

Step 1 Make a table of values for $y = -3x^2 + 3$.



x	−2	−1	0	1	2
y	_____	___	___	___	_____

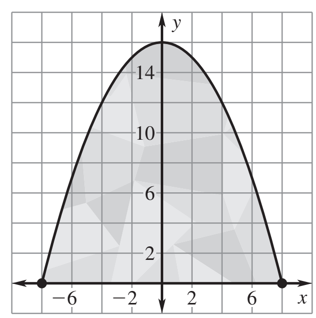
Step 2 ______ the points from the table.

Step 3 Draw a _______________ through the points.

Step 4 Compare the graphs. Both graphs have the same axis of symmetry. However, the graph of $y = -3x^2 + 3$ is ___________ and has a ________ vertex than the graph of $y = x^2$ because the graph of $y = -3x^2 + 3$ is a ________________ and a ____________________ of the graph of $y = x^2$.

Example 3 *Use a graph*

The stained glass window shown can be modeled by the graph of the function $y = -0.25x^2 + 16$ where x and y are measured in inches. Find the domain and range of the function in this situation.



Solution

Step 1 Find the domain. In the graph, the window extends ___ inches on either side of the origin. So the domain is ___________.

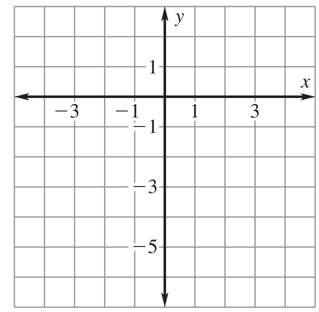
Step 2 Find the range using the fact that the highest point on the window is (___, _____) and the lowest point, ___, occurs at each end.

$y = -0.25($___$)^2 + 16 =$ ___, so the range is ____________.

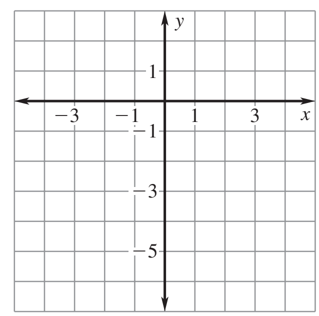
Your Notes

✔ *Checkpoint* Graph the function. Compare the graph with the graph of $y = x^2$.

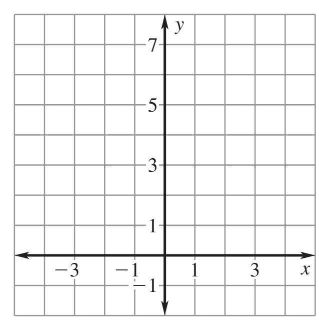
2. $y = \frac{1}{4}x^2 - 6$



3. $y = -x^2 - 3$

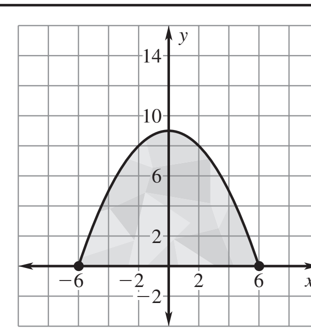


4. $y = -8x^2 + 5$



✔ *Checkpoint* Complete the following exercise.

5. In Example 3, suppose the stained glass window is modeled by the function $y = -0.25x^2 + 9$. Find the domain and range in this situation.



Homework

Name ______________________ Date ______________

LESSON 2.10 Practice

Use the quadratic function to complete the table of values.

1. $y = 5x^2$

x	−2	−1	0	1	2
y					

2. $y = -4x^2$

x	−2	−1	0	1	2
y					

3. $y = x^2 + 6$

x	−2	−1	0	1	2
y					

4. $y = x^2 - 8$

x	−2	−1	0	1	2
y					

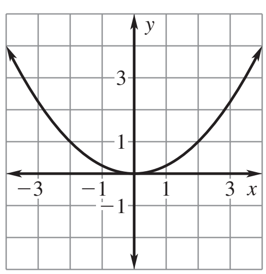
Match the function with its graph.

5. $y = -\frac{1}{2}x^2$

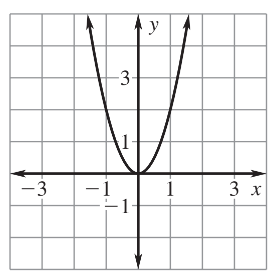
6. $y = 2x^2$

7. $y = \frac{1}{4}x^2$

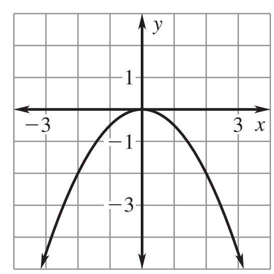
A.



B.

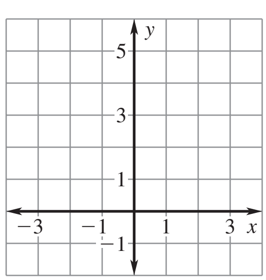


C.

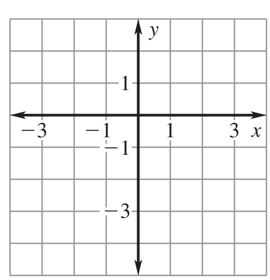


Graph the function and identify its domain and range. Compare the graph with the graph of $y = x^2$.

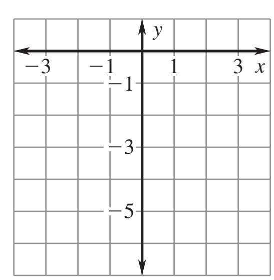
8. $y = 5x^2$



9. $y = -\frac{1}{3}x^2$



10. $y = -6x^2$



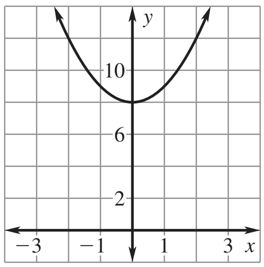
Name ______________________ Date ______________

LESSON 2.10

Practice *continued*

Identify the vertex and axis of symmetry of the graph.

11.



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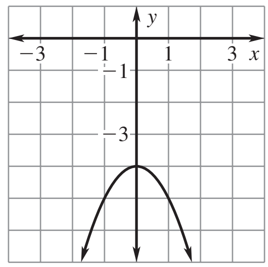

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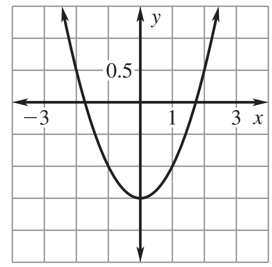


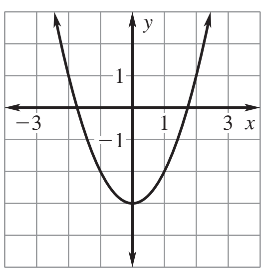
Match the function with its graph.

14. $y = x^2 - 3$

15. $y = 3x^2 - 1$

16. $y = -x^2 + 3$

A.



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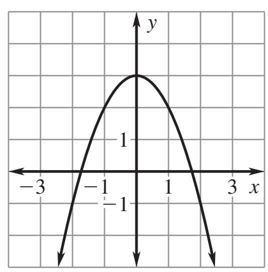

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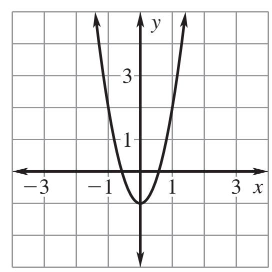
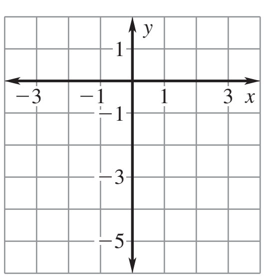
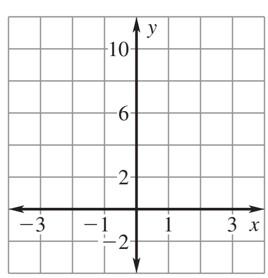


Graph the function and identify its domain and range. Compare the graph with the graph of $y = x^2$.

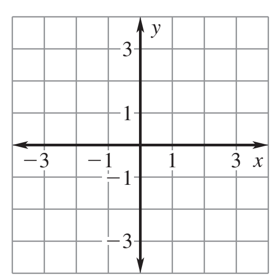
17. $y = x^2 - 5$



18. $y = x^2 + 7$



19. $y = 2x^2 - 3$



Name ______________________ Date ______________

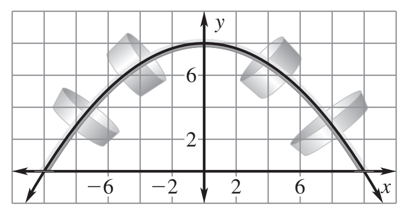
LESSON 2.10 **Practice** *continued*

Complete the statement.

20. The graph of $y = x^2 + 5$ can be obtained from the graph of $y = x^2$ by shifting the graph of $y = x^2$ __?__.

21. The graph of $y = 10x^2$ can be obtained from the graph of $y = x^2$ by __?__ the graph of $y = x^2$ by a factor of __?__.

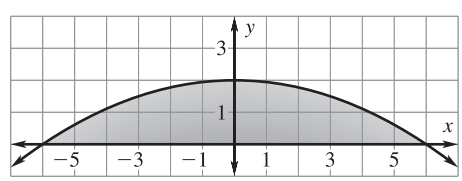
22. **Pot Rack** A cross section of the pot rack shown can be modeled by the graph of the function $y = -0.08x^2 + 8$ where x and y are measured in inches.



a. Find the domain of the function in this situation.

b. Find the range of the function in this situation.

23. **Drawer Handle** A cross section of the drawer handle shown can be modeled by the graph of the function $y = -\frac{1}{18}x^2 + 2$ where x and y are measured in centimeters.



a. Find the domain of the function in this situation.

b. Find the range of the function in this situation.

2.11 Graph $y = ax^2 + bx + c$

Georgia Performance Standard(s)

MM1A1a, MM1A1c, MM1A1d

Your Notes

Goal • Graph general quadratic functions.

VOCABULARY

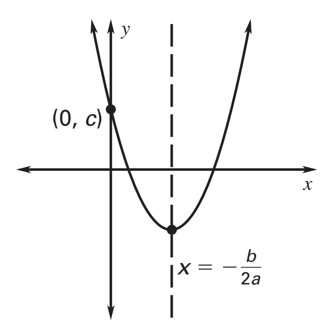
Minimum value

Maximum value

PROPERTIES OF THE GRAPH OF A QUADRATIC FUNCTION

The graph of $y = ax^2 + bx + c$ is a parabola that:

- opens _______ if $a > 0$ and opens _______ if $a < 0$.
- is narrower than the graph of $y = x^2$ if $|a|$ ___ 1 and wider if $|a|$ ___ 1.
- has an axis of symmetry of $x = \frac{\_\_\_}{\_\_\_}$.
- has a vertex with an x-coordinate of $\frac{\_\_\_}{\_\_\_}$.
- has a y-intercept of ___. So, the point (___, ___) is on the parabola.



MINIMUM AND MAXIMUM VALUES

For $y = ax^2 + bx + c$, the y-coordinate of the vertex is the ___________ value of the function if a ___ 0 and the ___________ value of the function if a ___ 0.

Your Notes

Example 1 ***Find the axis of symmetry and the vertex***

Consider the function $y = -2x^2 + 16x - 15$.

a. Find the axis of symmetry of the graph of the function.

b. Find the vertex of the graph of the function.

Solution

a. For the function $y = -2x^2 + 16x - 15$, $a =$ _____ and $b =$ _____.

$x = -\frac{b}{2a} = \frac{\quad}{\_\_\_\_\_\_\_\_\_} =$ ___

The axis of symmetry is $x =$ ___.

b. The x-coordinate of the vertex is $-\frac{b}{2a}$, or ___. To find the y-coordinate, substitute ___ for x in the function and find y.

$y = -2(\_\_\_)^2 + 16(\_\_\_) - 15 =$ ____

The vertex is (___, ____).

Example 2 ***Find the minimum or maximum value***

Tell whether the function $f(x) = 5x^2 - 20x + 17$ has a *minimum value* or a *maximum value*. Then find the minimum or maximum value.

Solution

Because $a =$ ___ and _______, the parabola opens _____ and the function has a ____________ value. To find the ____________ value, find the ________.

$x = -\frac{b}{2a} = \frac{\quad}{\_\_\_\_\_\_\_\_} =$ ___   **The x-coordinate is $-\frac{b}{2a}$.**

$f(\_\_\_) = 5(\_\_\_)^2 - 20(\_\_\_) + 17$ **Substitute ___ for x.**

$= \_\_\_\_\_$ **Simplify.**

The ____________ value of the function is ____________.

Your Notes

✔ ***Checkpoint*** **Find the axis of symmetry and the vertex of the graph of the function.**

1. $y = 3x^2 + 18x + 5$

2. $y = \frac{1}{4}x^2 - 4x + 7$

✔ ***Checkpoint*** **Complete the following exercise.**

3. Tell whether the function $f(x) = -\frac{1}{2}x^2 + 6x + 8$ has a *minimum value* or a *maximum value*. Then find the minimum or maximum value.

Your Notes

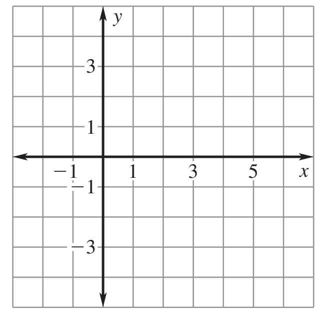
Example 3 ***Graph $y = ax^2 + bx + c$***

Graph $y = -x^2 + 4x - 1$.

Step 1 **Determine** whether the parabola opens up or down. Because a ___ 0, the parabola opens ________.

Step 2 **Find** and draw the axis of symmetry:

$x = -\frac{b}{2a} = \frac{\quad}{_________} = $ ___.



Step 3 **Find** and plot the vertex. The x-coordinate of the vertex is $\frac{\quad}{\_\_\_\_\_\_}$, or ___.

To find the y-coordinate, substitute ___ for x in the function and simplify.

$y = -(\_\_\_)^2 + 4(\_\_\_) - 1 = 3$

So, the vertex is (___, ___).

Step 4 **Plot** two points. Choose two x-values less than the x-coordinate of the vertex. Then find the corresponding y-values.

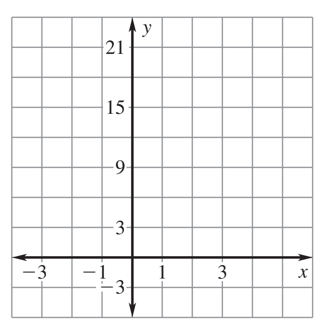
x	1	0
y	___	_____

Step 5 _________ the points plotted in Step 4 in the axis of symmetry.

Step 6 **Draw** a ___________ through the plotted points.

✔ ***Checkpoint*** **Complete the following exercise.**

4. Graph the function $y = 4x^2 + 8x + 3$. Label the vertex and axis of symmetry.

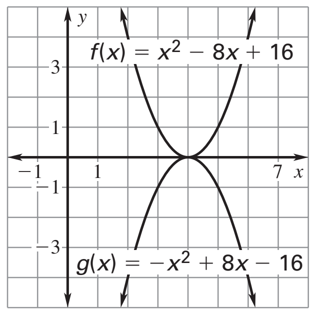


Your Notes

Example 4 ***Compare graphs***

Compare the graph of $f(x) = x^2 - 8x + 16$ and $g(x) = -x^2 + 8x - 16$.

Solution

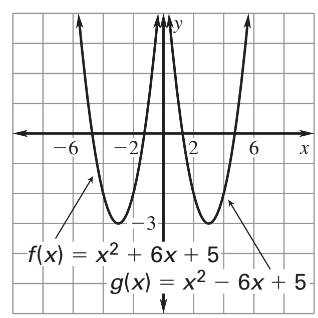


Consider the ________ as a mirror. The graph of $g(x) = -x^2 + 8x - 16$ is the mirror image of the graph of $f(x) = x^2 - 8x + 16$. So, the graph of $g(x)$ is a __________________________ of the graph of $f(x)$.

Checkpoint **Compare the graphs of $f(x)$ and $g(x)$.**

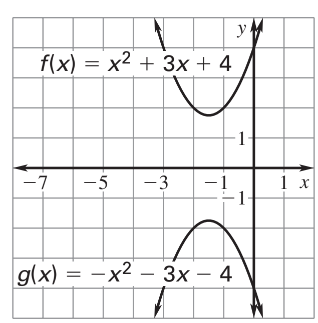
5. $f(x) = x^2 + 6x + 5$

$g(x) = x^2 - 6x + 5$



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

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



Homework

Name ______________________________ Date ________________

LESSON 2.11 Practice

Identify the values of *a*, *b*, and *c* in the quadratic function.

1. $y = 7x^2 + 2x + 11$

2. $y = 3x^2 - 5x + 1$

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

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

5. $y = \frac{1}{2}x^2 - x - 5$

6. $y = -x^2 + 7x - 6$

Tell whether the graph opens *upward* or *downward*. Then find the axis of symmetry of the graph of the function.

7. $y = x^2 + 6$

8. $y = -x^2 - 1$

9. $y = x^2 + 6x + 1$

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

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

12. $y = -x^2 + 8x + 3$

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

14. $y = -x^2 + 7x - 2$

15. $y = 3x^2 + 6x + 10$

Find the vertex of the graph of the function.

16. $y = x^2 + 5$

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

18. $y = x^2 + 10x + 3$

Name ______________________ Date ____________

LESSON 2.11

Practice *continued*

19. $y = -x^2 + 4x - 2$

20. $y = 3x^2 + 6x + 1$

21. $y = -2x^2 + 8x - 3$

22. $y = 10x^2 - 10x + 7$

23. $y = x^2 + x + 3$

24. $y = x^2 - x + 1$

Use the quadratic function to complete the table of values.

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

x	1	2	3	4	5
y					

26. $y = -x^2 + 12x - 5$

x	4	5	6	7	8
y					

27. $y = 7x^2 + 14x + 2$

x	−3	−2	−1	0	1
y					

28. $y = -2x^2 - 4x + 1$

x	−3	−2	−1	0	1
y					

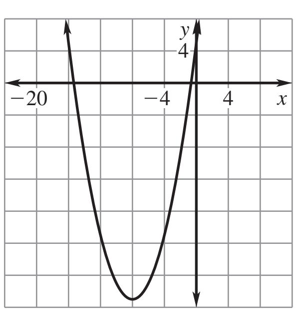
Match the function with its graph.

29. $y = 8x^2 + 2x + 3$

30. $y = 2x^2 + 8x + 1$

31. $y = \frac{1}{2}x^2 + 8x + 5$

A.



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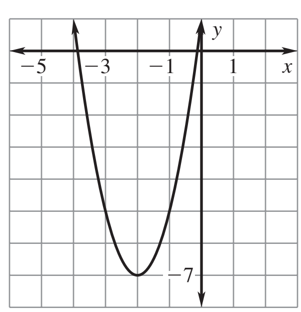
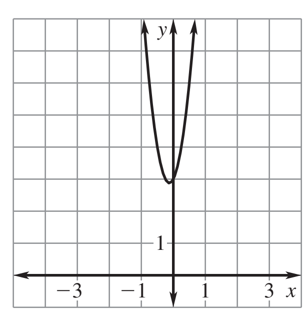


C.



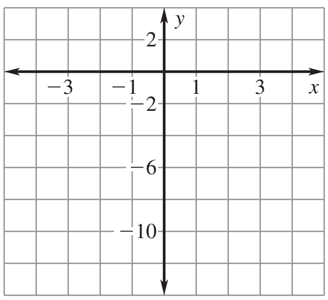
Name ______________________ Date ______________

LESSON 2.11

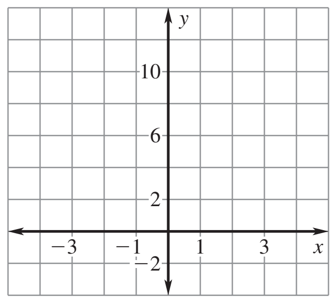
Practice *continued*

Graph the function. Label the vertex and axis of symmetry.

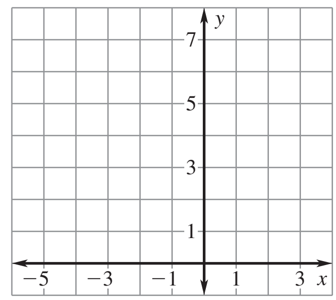
32. $y = -x^2 - 6$



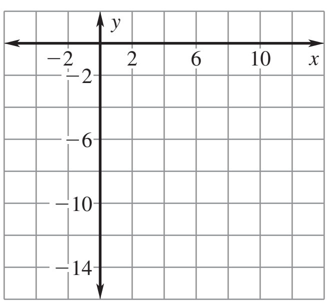
33. $y = x^2 + 7$



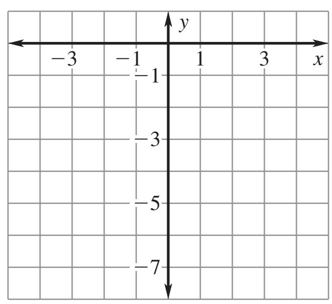
34. $y = x^2 + 2x + 5$



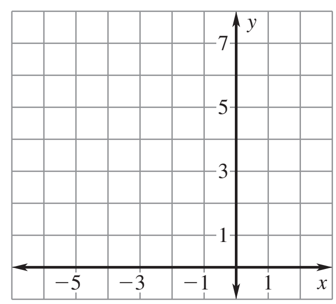
35. $y = x^2 - 8x + 1$



36. $y = -2x^2 + x - 3$



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



Tell whether the function has a *minimum value* or a *maximum value*. Then find the minimum or maximum value.

38. $f(x) = x^2 - 7$

39. $f(x) = -x^2 + 9$

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

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

42. $f(x) = \frac{1}{4}x^2 - 8x + 1$

43. $f(x) = -3x^2 + 11$

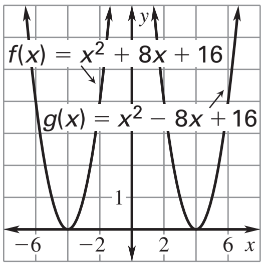
Name ____________________ Date ____________

LESSON 2.11

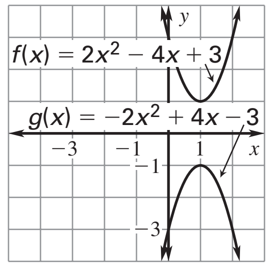
Practice *continued*

Compare the graphs of $f(x)$ and $g(x)$.

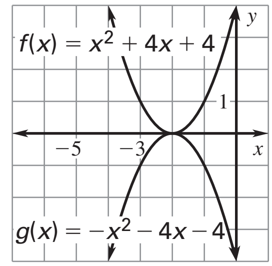
44.



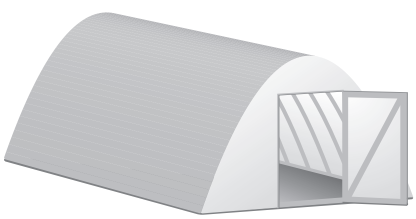
45.

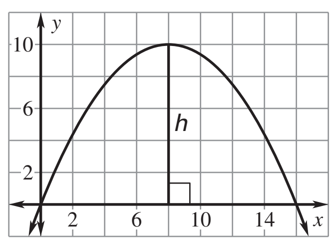


46.

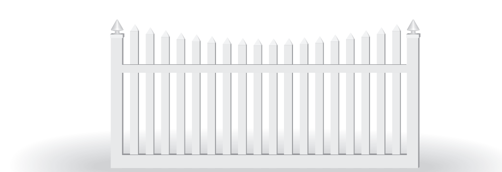


47. Greenhouse The dome of the greenhouse shown can be modeled by the graph of the function $y = -0.15625x^2 + 2.5x$ where x and y are measured in feet. What is the height h at the highest point of the dome as shown in the diagram?





48. Fencing A parabola forms the top of a fencing panel as shown. This parabola can be modeled by the graph of the function $y = 0.03125x^2 - 0.25x + 4$ where x and y are measured in feet and y represents the number of feet the parabola is above the ground. How far above the ground is the lowest point of the parabola formed by the fence?



2.12 Solve Quadratic Equations by Graphing

Georgia Performance Standard(s)

MM1A1d, MM1A3c

Your Notes

Goal • Solve quadratic equations by graphing.

VOCABULARY

Quadratic equation

Example 1 ***Solve a quadratic equation having two solutions***

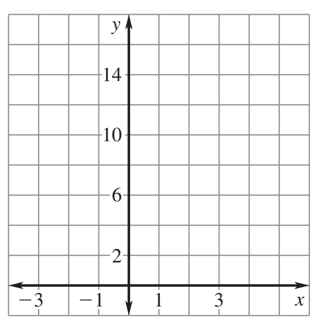
Solve $-x^2 + 2x = -8$ by graphing.

Step 1 **Write** the equation in ________________.

$-x^2 + 2x = -8$ **Write original equation.**

$-x^2 + 2x + 8 =$ ___ **Add ___ to each side.**

Step 2 **Graph** the function $y = -x^2 + 2x + 8$.
The x-intercepts are _____ and ___.



The solutions of the equation $-x^2 + 2x = -8$ are _____ and ___.

CHECK You can check _____ and ___ in the original equation.

$-x^2 + 2x = -8$ $-x^2 + 2x = -8$

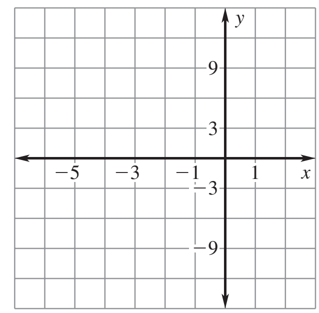
$-(\_\_\_\_\_)^2 + 2(\_\_\_\_\_) \stackrel{?}{=} -8$ $-(\_\_\_)^2 + 2(\_\_\_) \stackrel{?}{=} -8$

_____ = _____ _____ = ____

Your Notes

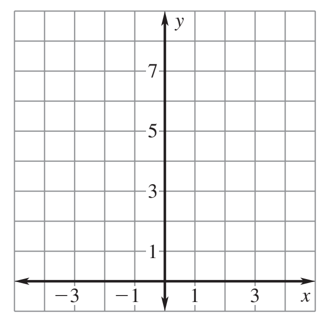
✔ ***Checkpoint*** **Complete the following exercise.**

1. Solve $x^2 - 6 = -5x$ by graphing.



Example 2 ***Solve a quadratic equation having one solution***

Solve $x^2 - 4x = -4$ by graphing.



Step 1 **Write** the equation in standard form.

$x^2 - 4x = -4$ **Write original equation.**

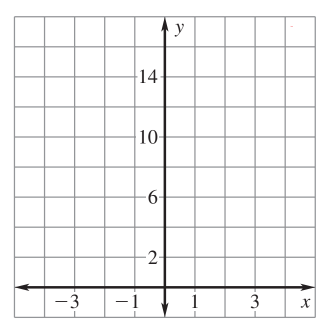
$x^2 - 4x + 4 =$ ___ **Add ___ to each side.**

Step 2 ________ the function $y = x^2 - 4x + 4$. The x-intercept is ___.

The solution of the equation $x^2 - 4x = -4$ is ___.

Example 3 ***Solve a quadratic equation having no solution***

Solve $x^2 + 8 = 2x$ by graphing.



Step 1 **Write** the equation in standard form.

$x^2 + 8 = 2x$ **Write original equation.**

____________________ **Subtract _____ from each side.**

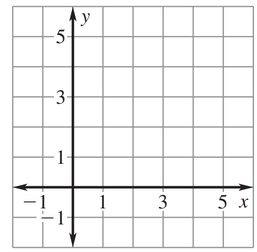
Step 2 ________ the function $y =$ ______________. The graph has _____ x-intercepts.

The equation $x^2 + 8 = 2x$ has ______________.

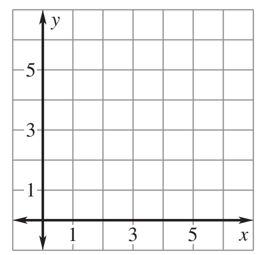
Your Notes

Checkpoint **Solve the quadratic equation by graphing.**

2. $x^2 + 9 = 6x$

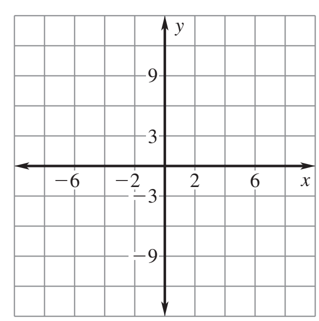


3. $x^2 - 7x = -15$



Example 4 ***Find the zeros of a quadratic function***

Find the zeros of $f(x) = -x^2 - 8x - 7$.



Graph the function $f(x) = -x^2 - 8x - 7$. The x-intercepts are _____ and _____.

The zeros of the function are _____ and _____.

CHECK Substitute _____ and _____ in the original function.

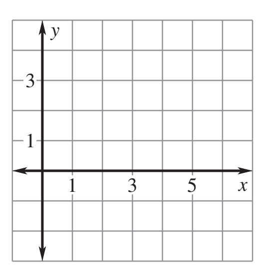
$f(\_\_\_\_\_) = -(\_\_\_\_\_)^2 - 8(\_\_\_\_\_) - 7 = \_\_\_$

$f(\_\_\_\_\_) = -(\_\_\_\_\_)^2 - 8(\_\_\_\_\_) - 7 = \_\_\_$

Checkpoint **Find the zeros of the function.**

Homework

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



Name ____________________ Date ____________

LESSON 2.12 Practice

Write the equation in standard form.

1. $x^2 + 3x = -12$

2. $x^2 - 8x = 14$

3. $x^2 = 9x - 1$

4. $x^2 = 6 - 10x$

5. $14 - x^2 = 3x$

6. $\frac{1}{2}x^2 = -3x - 7$

Determine whether the given value is a solution of the equation.

7. $x^2 + 36 = 0; -6$

8. $100 - x^2 = 0; -10$

9. $0 = x^2 + 6x + 5; -1$

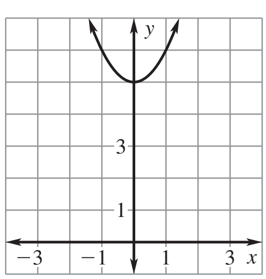
10. $x^2 - 5x + 6 = 0; 2$

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

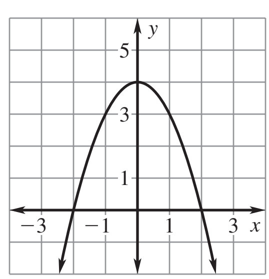
12. $0 = -x^2 + 8x + 3; 8$

Use the graph to find the solutions of the given equation.

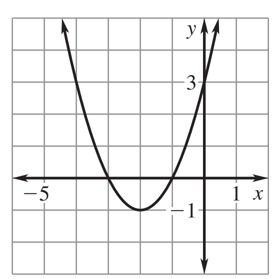
13. $x^2 + 5 = 0$



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

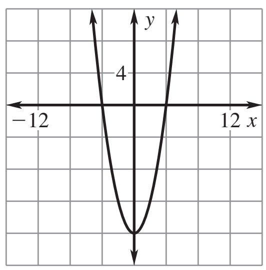


15. $x^2 + 4x + 3 = 0$

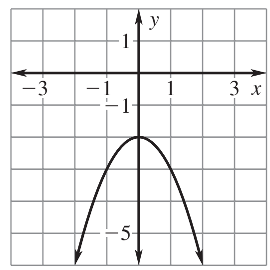


LESSON 2.12 Practice *continued*

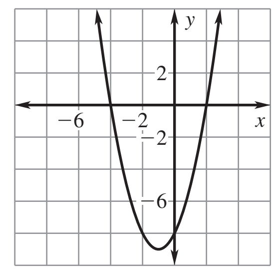
16. $x^2 - 16 = 0$



17. $x^2 - 2 = 0$

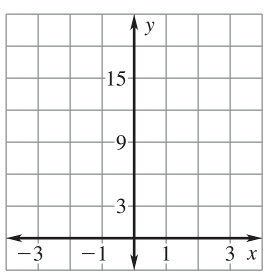


18. $x^2 + 2x - 8 = 0$

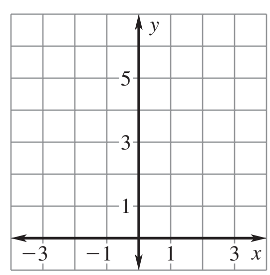


Solve the equation by graphing.

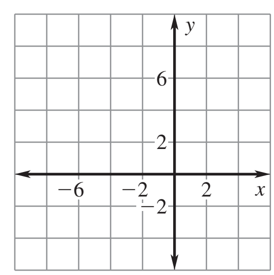
19. $8x^2 + 2x + 3 = 0$



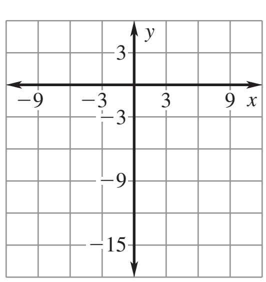
20. $2x^2 + 3x + 1 = 0$



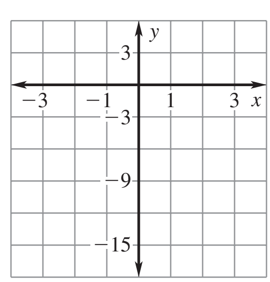
21. $\frac{1}{2}x^2 + 4x + 6 = 0$



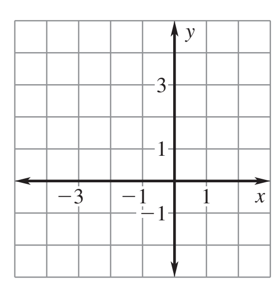
22. $x^2 - 2x - 15 = 0$



23. $-2x^2 + x - 3 = 0$



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



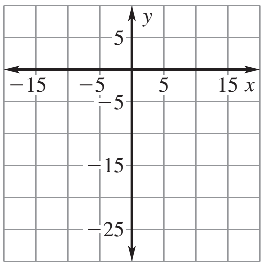
Name ______________________________ Date ______________

LESSON 2.12

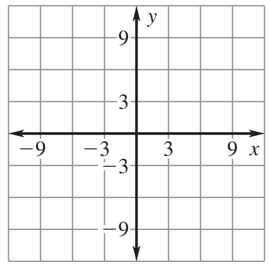
Practice *continued*

Find the zeros of the function by graphing the function.

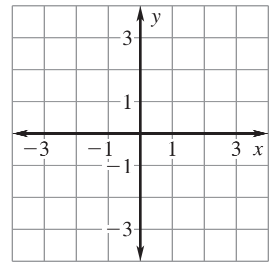
25. $f(x) = x^2 - 25$



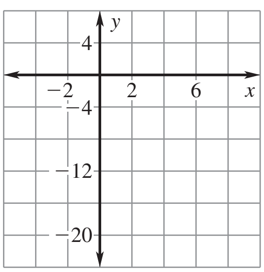
26. $f(x) = -x^2 + 9$



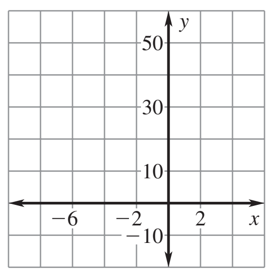
27. $f(x) = 2x^2 + 4x$



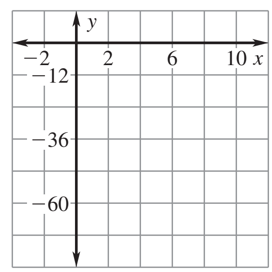
28. $f(x) = x^2 - 4x - 12$



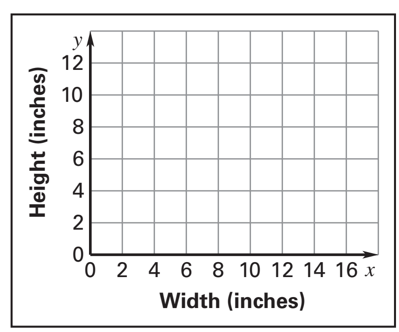
29. $f(x) = -x^2 - 3x + 40$



30. $f(x) = 3x^2 - 30x$



31. Plate Cover A plate cover made of netting has a cross section in the shape of a parabola. The cross section can be modeled by the function $y = -0.1875x^2 + 3x$ where x is the width of the cover (in inches) and y is the height of the cover (in inches).



a. Graph the function.

b. Find the domain and range of the function in this situation.

c. How wide is the cover?

d. How tall is the cover?

2.13 Use Square Roots to Solve Quadratic Equations

Georgia Performance Standard(s)

MM1A3a

Goal • Solve a quadratic equation by finding square roots.

Your Notes

VOCABULARY

Square root

Radicand

Perfect square

Example 1 ***Solve quadratic equations***

Solve the equation.

a. $z^2 - 5 = 4$ **b.** $r^2 + 7 = 4$

Solution

a. $z^2 - 5 = 4$ **Write original equation.**

$z^2 =$ ___ **Add ___ to each side.**

$z =$ ______ **Take square roots of each side.**

$z =$ _____ **Simplify.**

The solutions are _____ and ___.

b. $r^2 + 7 = 4$ **Write original equation.**

$r^2 =$ _____ **Subtract ___ from each side.**

Negative real numbers do not have real ______________.
So, there is _____________.

Your Notes

Example 2 *Take square root of a fraction*

Solve the equation $25k^2 = 9$.

Solution

$25k^2 = 9$ Write original equation.

$k^2 = \_\_\_\_$ Divide each side by ____.

$k = \_\_\_\_\_\_$ Take square roots of each side.

$k = \_\_\_\_$ Simplify.

The solutions are ____ and ____.

Checkpoint **Solve the equation.**

1. $3x^2 = 108$	2. $t^2 + 17 = 17$	3. $81p^2 = 4$

Example 3 *Approximate solutions of a quadratic equation*

Solve $4x^2 + 3 = 23$. Round the solutions to the nearest hundredth.

Solution

$4x^2 + 3 = 23$ Write original equation.

$4x^2 = \_\_\_\_$ Subtract ____ from each side.

$x^2 = \_\_\_\_$ Divide each side by ____.

$x = \_\_\_\_\_\_$ Take square roots of each side.

$x \approx \_\_\_\_\_\_$ Use a calculator. Round to the nearest hundredth.

The solutions are about _______ and ______.

Your Notes

✔ *Checkpoint* **Solve the equation. Round the solutions to the nearest hundredth.**

4. $2x^2 - 7 = 9$	**5.** $6g^2 + 1 = 19$

Example 4 ***Solve a quadratic equation***

Solve $5(x + 1)^2 = 30$. Round the solutions to the nearest hundredth.

Solution

$5(x + 1)^2 = 30$	**Write original equation.**
$(x + 1)^2 =$ ___	**Divide each side by ___.**
$x + 1 =$ ______	**Take square roots of each side.**
$x =$ __________	**Subtract ___ from each side.**

The solutions are __________ $\approx$ ______ and __________ $\approx$ _______.

✔ *Checkpoint* **Solve the equation. Round the solutions to the nearest hundredth, if necessary.**

6. $3(m - 4)^2 = 12$	**7.** $4(a - 3)^2 = 32$

Homework

Name ______________________ Date ______________

LESSON 2.13

Practice

Evaluate the expression.

1. $\sqrt{49}$

2. $\sqrt{225}$

3. $\sqrt{100}$

Isolate the variable in the equation.

4. $9x^2 - 18 = 0$

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

6. $10x^2 - 40 = 0$

Solve the equation.

7. $x^2 = 36$

8. $x^2 - 9 = 0$

9. $5x^2 = 20$

10. $5x^2 - 45 = 0$

11. $2x^2 - 18 = 0$

12. $3x^2 - 12x = 0$

Evaluate the expression. Round your answer to the nearest hundredth.

13. $\sqrt{5}$

14. $\sqrt{10}$

15. $\sqrt{12}$

Solve the equation. Round the solutions to the nearest hundredth.

16. $x^2 = 8$

17. $x^2 - 3 = 0$

18. $7x^2 - 14 = 0$

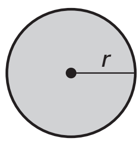
Name ____________________ Date ____________

LESSON 2.13

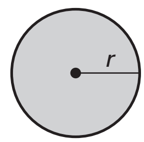
Practice *continued*

Use the given area *A* of the circle to find the radius *r* or the diameter *d* of the circle. Round the answer to the nearest hundredth, if necessary.

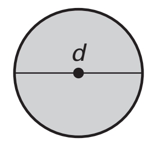
19. $A = 25\pi \text{ m}^2$



20. $A = 121\pi \text{ in.}^2$



21. $A = 23\pi \text{ cm}^2$



22. **Boat Racing** The maximum speed s (in knots or nautical miles per hour) that some kinds of boats can travel can be modeled by $s^2 = \frac{16}{9}x$ where x is the length of the water line in feet. Find the maximum speed of a sailboat with a 20-foot water line. Round your answer to the nearest hundredth.

23. **Tanks** You can find the radius r (in inches) of a cylindrical air compressor receiver tank by using the formula $c = \frac{1}{73.53}hr^2$ where h is the height of the tank (in inches) and c is the capacity of the tank (in gallons). Find the tank radius of each tank in the table. Round your answers to the nearest inch.

Tank	Height (in.)	Radius (in.)	Capacity (in.^3)
A	24		12
B	36		24
C	48		65

Words to Review

Give an example of the vocabulary word.

Monomial	Degree of a monomial
Polynomial	Degree of a polynomial
Leading coefficient	Binomial
Trinomial	Area model for polynomial arithmetic
Volume model for polynomial arithmetic	Pascal's Triangle

Roots	Vertical motion model
Perfect square trinomial	Factor by grouping
Factor completely	Quadratic function
Parabola	Parent quadratic function

Vertex	**Axis of symmetry**
Minimum value	**Maximum value**
Quadratic equation	**Square root**
Radicand	**Perfect square**