Integrated Math 1 Honors
Module 10
Structures of Expressions
Ready, Set, Go! Homework Solutions

Adapted from

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Name **Structures of Expressions** | **10.1H**

Ready, Set, Go!

Ready

Topic: Standard form of a quadratic equation

The standard form of a quadratic equation is defined as $y = ax^2 + bx + c$ $(a \neq 0)$. Multiply and write each product in the form $y = ax^2 + bx + c$. Then identify a, b, and c.

1. $y = x(x - 4)$

   $y = x^2 - 4x$

   a. 1
   b. -4
   c. 0

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

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

   a. 2
   b. -3
   c. 1

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

   $y = 9x^2 - 4$

   a. 9
   b. 0
   c. -4

4. $y = (x + 6)(x + 6)$

   $y = x^2 + 12x + 36$

   a. 1
   b. 12
   c. 36

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

   $y = x^2 - 6x + 9$

   a. 1
   b. -6
   c. 9

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

   $y = -x^2 - 10x - 25$

   a. -1
   b. -10
   c. -25

Set

Topic: Writing the equation of a parabola in vertex form.

Find a value for ω such that the graph will have the specified number of x-intercepts.

7. $y = x^2 + \omega$
   2 x-intercepts

   Sample Answers:
   $y = x^2 - 4, y = x^2 - 5$

8. $y = x^2 + \omega$
   1 x-intercept

   Sample Answer:
   $y = (x - 3)^2$

9. $y = x^2 + \omega$
   no x-intercepts

   Sample Answers:
   $y = x^2 + 6, y = x^2 + 1$

For each function, identify the vertex, direction of opening, and the equation of the axis of symmetry. Then complete the table of values so that the table includes the vertex and two symmetric points on each side of the axis of symmetry.

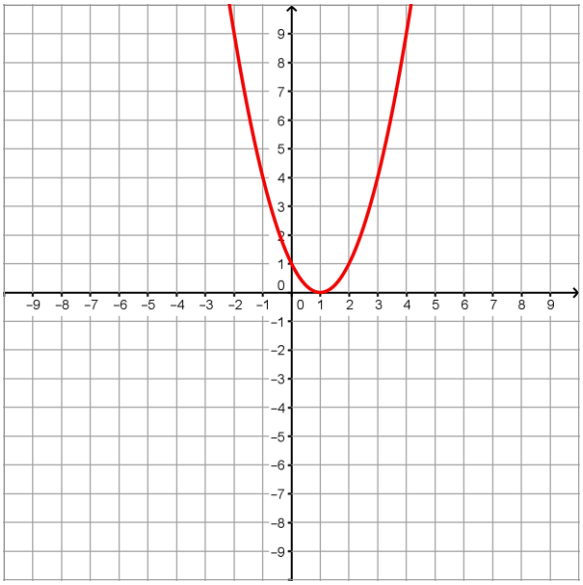
10. $y = (x-1)^2$

Vertex: $(1, 0)$

Direction of Opening: **up**

Axis of Symmetry: $x = 1$

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



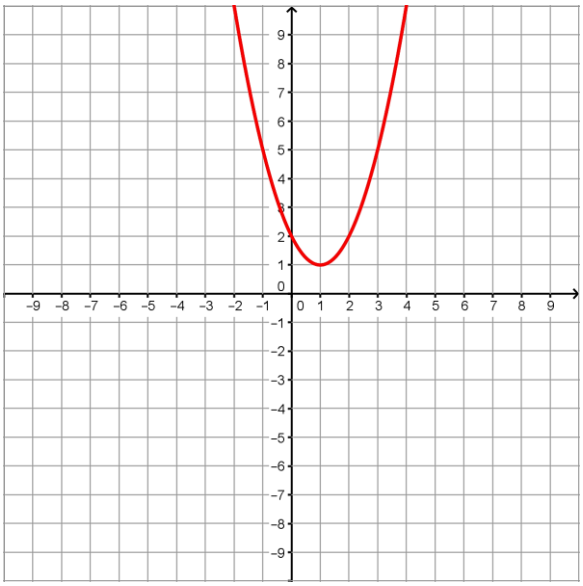
11. $y = (x-1)^2 + 1$

Vertex: $(1, 1)$

Direction of Opening: **up**

Axis of Symmetry: $x = 1$

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



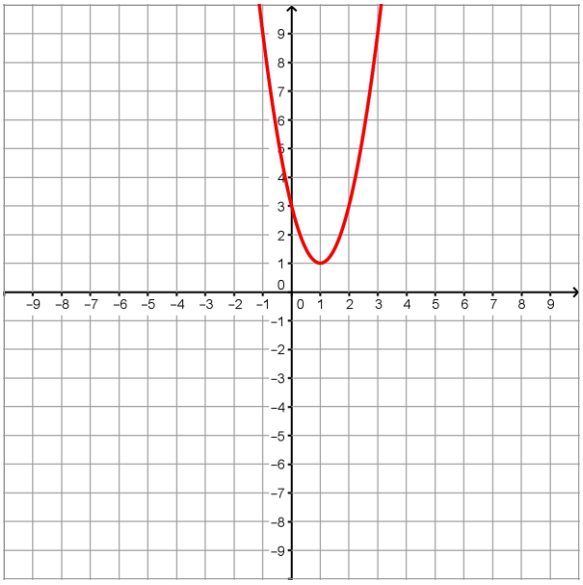
12. $y = 2(x-1)^2 + 1$

Vertex: $(1, 1)$

Direction of Opening: **up**

Axis of Symmetry: $x = 1$

x	y
-1	9
0	3
1	1
2	3
3	9



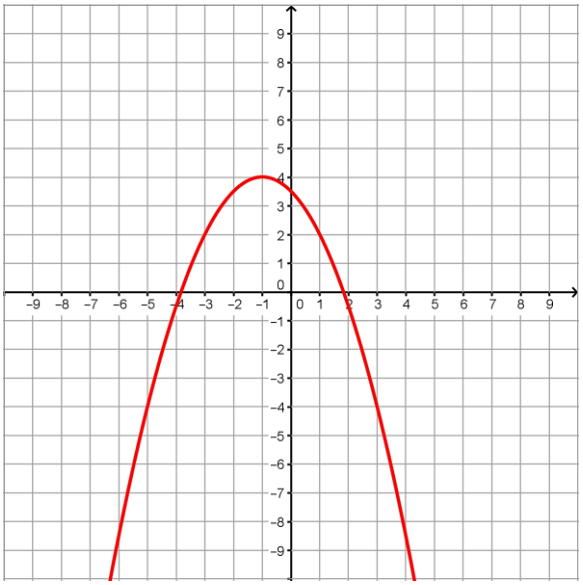
13. $y = -0.5(x+1)^2 + 4$

Vertex: $(-1, 4)$

Direction of Opening: **down**

Axis of Symmetry: $x = -1$

x	y
-3	2
-2	3.5
-1	4
0	3.5
1	2



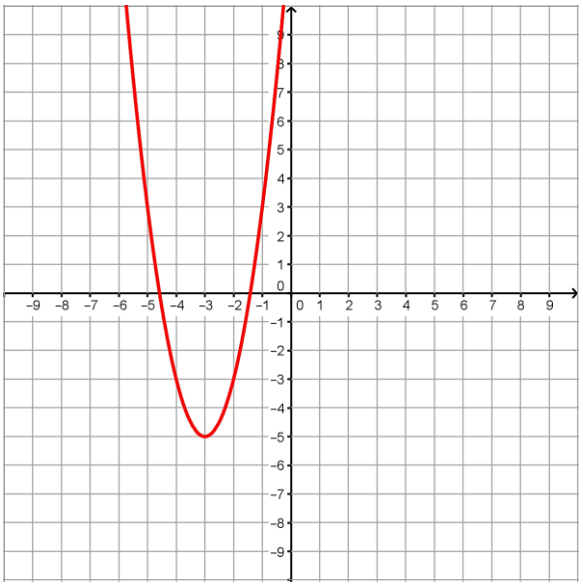
14. $y = 2(x+3)^2 - 5$

Vertex: $(-3, -5)$

Direction of Opening: **up**

Axis of Symmetry: $x = -3$

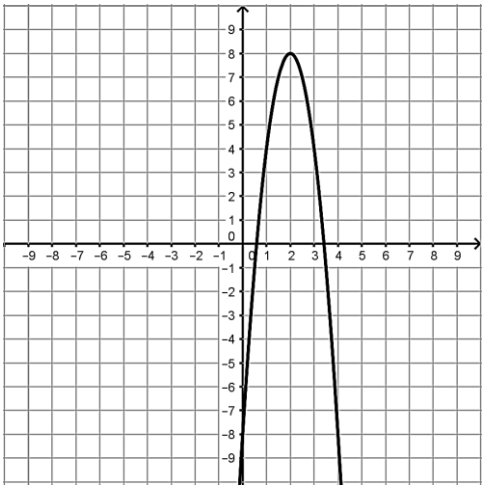
x	y
-5	3
-4	-3
-3	-5
-2	-3
-1	3



Topic: Writing equations of parabolas in vertex form.

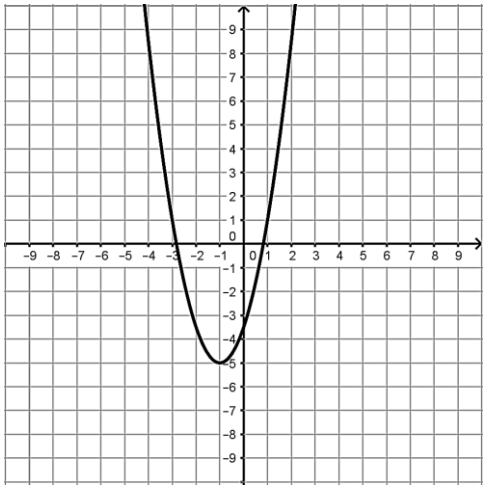
Write the vertex form of the following quadratic functions.

15.



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

16.



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

17.

x	y
-1	11
0	5
1	3
2	5
3	11
4	21

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

18.

x	y
-10	-41
-9	-20
-8	-5
-7	4
-6	7
-5	4

$y = -3(x+6)^2 + 7$

Go

Use the table to identify the **vertex**, the equation for the **axis of symmetry (A.S.)**, and state the **number of *x*-intercept(s)** the parabola will have, if any. Will the vertex be a **minimum** or a **maximum**?

19.

x	y
-4	10
-3	3
-2	-2
-1	-5
0	-6
1	-5
2	-2

Vertex: $(0, -6)$
A.S.: $x = 0$
x-inter: 2
max or min? **min**

20.

x	y
-2	49
-1	28
0	13
1	4
2	
3	4
4	13

Vertex: $(2, 1)$
A.S.: $x = 2$
x-inter: 0
max or min? **min**

21.

x	y
-7	-9
-6	3
-5	7
-4	3
-3	-9
-2	-29
-1	-57

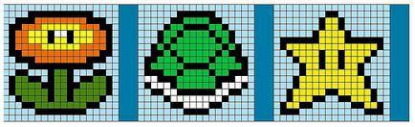
Vertex: $(-5, 7)$
A.S.: $x = -5$
x-inter: 2
max or min? **max**

22.

x	y
-8	-9
-7	-8
-6	-9
-5	-12
-4	-17
-3	-24
-2	-33

Vertex: $(-7, -8)$
A.S.: $x = -7$
x-inter: 0
max or min? **max**

Name **Structures of Expressions** | **10.2H**

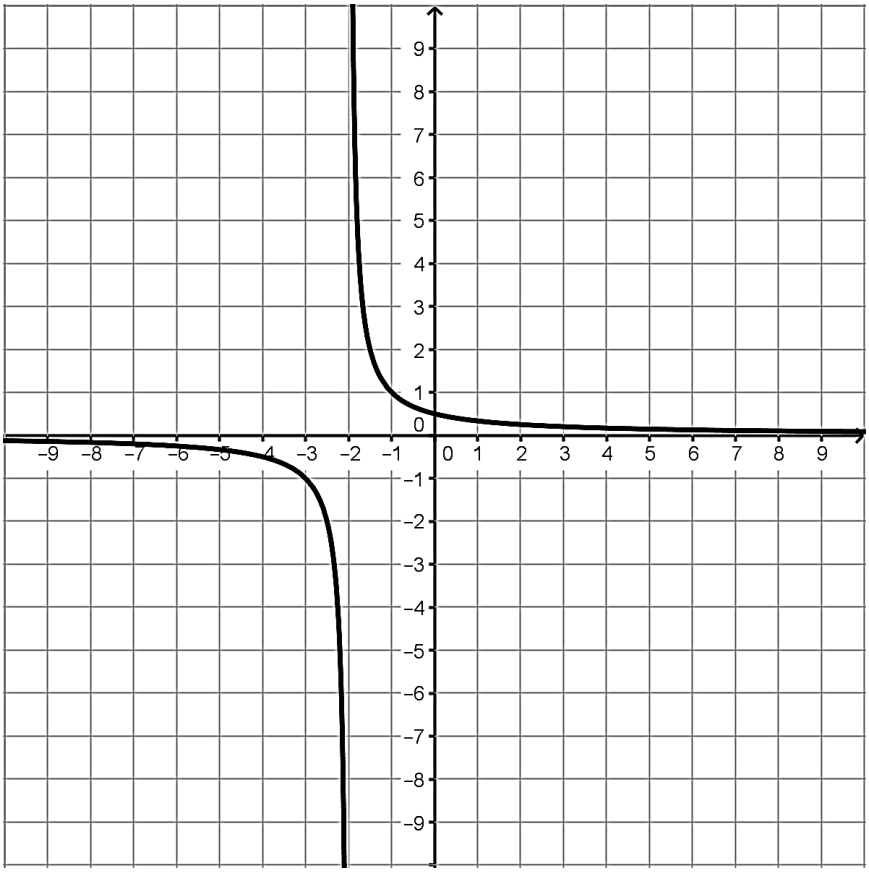


Ready, Set, Go!

Ready

Topic: Rational functions

1. Use the graph of $f(x) = \frac{1}{x+2}$ to answer the following questions:



a. What is the domain of $f(x)$?

$x \neq -2$

b. What is the range of $f(x)$?

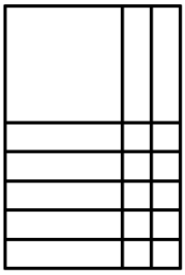
$y \neq 0$

c. Complete the table of values for $f(x) = \frac{1}{x+2}$:

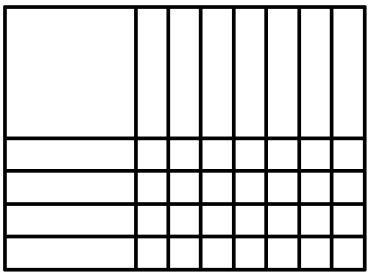
x	$f(x)$
-4	$-\frac{1}{2}$
-3	-1
-2	undefined
-1	1
0	$\frac{1}{2}$
1	$\frac{1}{3}$
2	$\frac{1}{4}$

2. Write expressions for the given area models. Write one expression that contains parentheses (factored form) and one that does not (standard form).

a. $(x+2)(x+5) = x^2 + 7x + 10$



b. $(x+7)(x+4) = x^2 + 11x + 28$



Set

Topic: Completing the square

Multiply. Show each step.

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

   $\mathbf{x^2+10x+25}$

4. $(3x-7)(3x-7)$

   $\mathbf{9x^2-42x+49}$

5. $(9x+1)^2$

   $\mathbf{81x^2+18x+1}$

6. $(4x-11)^2$

   $\mathbf{16x^2-88x+121}$

7. Write a rule for finding the coefficient of the x-term when multiplying and simplifying $(x+q)^2$.

   $\mathbf{2(xq)}$

Fill in the number that completes the square. Then write the trinomial in vertex form.

8. $x^2+8x+\_\_$

   $\mathbf{16, (x+4)^2}$

9. $x^2-10x+\_\_$

   $\mathbf{25, (x-5)^2}$

10. $x^2+16x+\_\_$

    $\mathbf{64, (x+8)^2}$

11. $x^2-6x+\_\_$

    $\mathbf{9, (x-3)^2}$

12. $x^2-22x+\_\_$

    $\mathbf{121, (x-11)^2}$

13. $x^2+18x+\_\_$

    $\mathbf{81, (x+9)^2}$

14. $2x^2-4x+\_\_$

    $\mathbf{2,\ 2(x-1)^2}$

15. $3x^2-12x+\_\_$

    $\mathbf{12,\ 3(x-2)^2}$

16. $4x^2+24x+\_\_$

    $\mathbf{36,\ 4(x+3)^2}$

Go

Topic: Identifying vertex , axis of symmetry, domain, range, and graphing quadratic functions in vertex form.

For each quadratic function written in vertex form $(y = a(x-h)^2 + k)$, identify the vertex, the equation of the axis of symmetry, direction of opening (up/down), if the graph has a maximum or minimum, if the graph is wider/narrower or the same width as $y = x^2$, domain, and range. Then make a table of values with the vertex and 2 symmetric points left and right of the vertex.

17. $y = 2(x+4)^2 - 6$

Vertex: $(-4, -6)$

Equation of Axis of Symmetry: $x = -4$

Direction of Opening (up or down): **up**

Max or Min: **Min**

Width is wider, narrower or same as $y = x^2$?
Narrower

Domain: $(-\infty, \infty)$

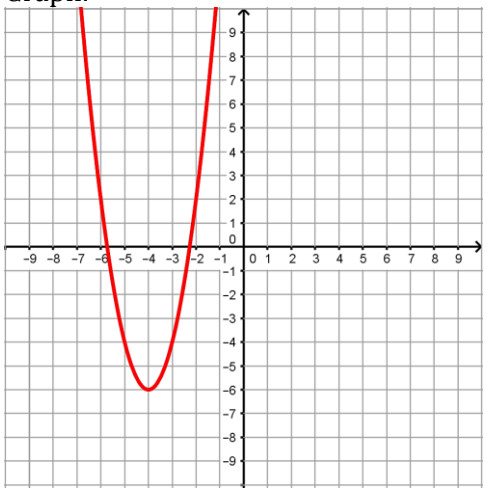
Range: $[-6, \infty)$

Intervals of Increase/Decrease:
Increase: $(-4, \infty)$
Decrease: $(-\infty, -4)$

Table of Values:

x	y
-6	2
-5	-4
-4	-6
-3	-4
-2	2

Graph:



18. $y = -\frac{1}{2}(x-2)^2 + 8$

Vertex: $(2, 8)$

Equation of Axis of Symmetry: $x = 2$

Direction of Opening (up or down): **down**

Max or Min: **Max**

Width is wider, narrower or same as $y = x^2$?
Wider

Domain: $(-\infty, \infty)$

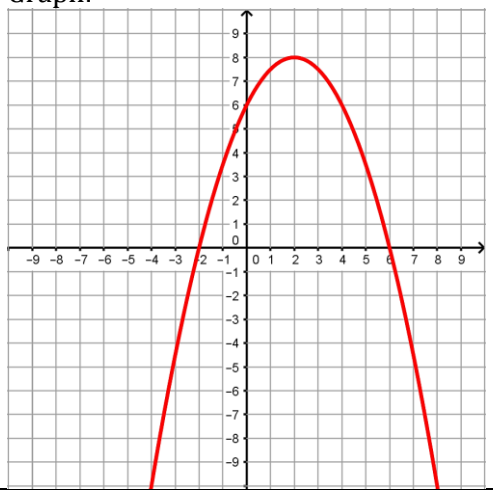
Range: $(-\infty, 8]$

Intervals of Increase/Decrease:
Increase: $(-\infty, 2)$
Decrease: $(2, \infty)$

Table of Values:

x	y
0	6
1	7.5
	8
3	7.5
4	6

Graph:



19. $y = (x-6)^2 + 1$

Vertex: $(6, 1)$

Equation of Axis of Symmetry: $x = 6$

Direction of Opening (up or down): **Up**

Max or Min: **Min**

Width is wider, narrower or same as $y = x^2$?
Same

Domain: $(-\infty, \infty)$

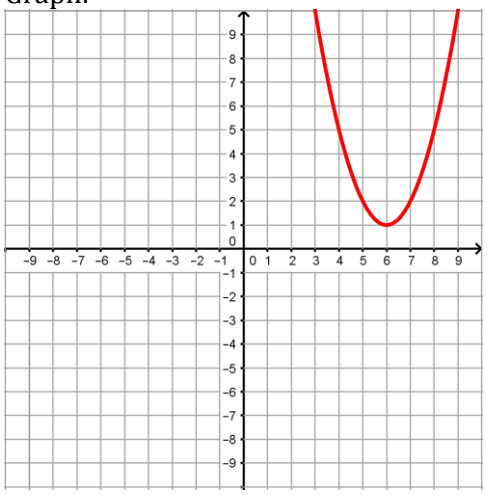
Range: $[1, \infty)$

Intervals of Increase/Decrease:
Increase: $(6, \infty)$
Decrease: $(-\infty, 6)$

Table of Values:

x	y
4	5
5	2
6	1
7	2
8	5

Graph:



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

Vertex: $(-3, 5)$

Equation of Axis of Symmetry: $x = -3$

Direction of Opening (up or down): **down**

Max or Min: **Max**

Width is wider, narrower or same as $y = x^2$?
Narrower

Domain: $(-\infty, \infty)$

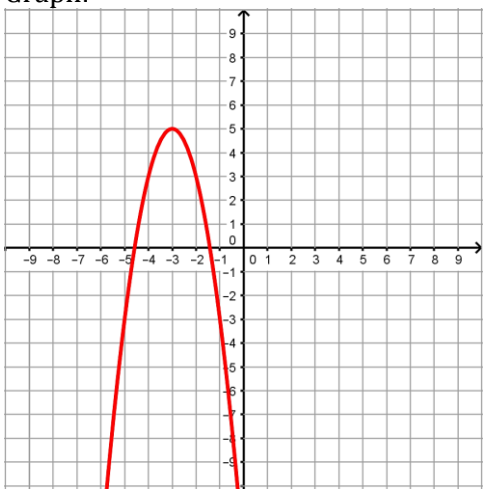
Range: $(-\infty, 5]$

Intervals of Increase/Decrease:
Increase: $(-\infty, -3)$
Decrease: $(-3, \infty)$

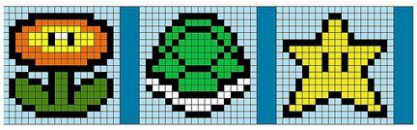
Table of Values:

x	y
−5	−3
−4	3
−3	5
−2	3
−1	−3

Graph:



Name **Structures of Expressions** | **10.3H**



Ready, Set, Go!

Ready

Topic: Multiplying binomials using an area model.

Multiply each set of binomials using an area model. If there is a coefficient in the question, distribute the coefficient last.

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

	$2x$	5
x	$2x^2$	$5x$
-8	$-16x$	-40

$2x^2 - 11x - 40$

2. $(3x-1)(2x+7)$

	$2x$	7
$3x$	$6x^2$	$21x$
-1	$-2x$	-7

$6x^2 + 19x - 7$

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

	x	-9
x	x^2	$-9x$
-3	$-3x$	27

$2x^2 - 24x + 54$

4. $-3(2x+3)(x+7)$

	$2x$	3
x	$2x^2$	$3x$
7	$14x$	21

$-6x^2 - 51x - 63$

Set

Topic: Completing the square

Complete the square on each function to write the function in vertex form, $y = a(x-h)^2 + k$.

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

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

6. $y = x^2 - 18x + 90$

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

7. $y = x^2 + 10x - 6$

$\boldsymbol{y = (x + 5)^2 - 31}$

8. $y = x^2 - 12x + 70$

$\boldsymbol{y = (x - 6)^2 + 34}$

9. $y = 2x^2 - 12x + 23$

$\boldsymbol{y = 2(x - 3)^2 + 5}$

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

$\boldsymbol{y = 3(x + 2)^2 - 4}$

11. $y = -x^2 + 8x - 9$

$\boldsymbol{y = -(x - 4)^2 + 7}$

12. $y = -2x^2 + 12x - 23$

$\boldsymbol{y = -2(x - 3)^2 - 5}$

Topic: Converting from vertex form to standard form

Multiply out the function to write it in standard form, $\boldsymbol{y = ax^2 + bx + c}$.

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

$\boldsymbol{y = x^2 - 14x + 52}$

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

$\boldsymbol{y = x^2 + 8x + 7}$

15. $y = 2(x + 6)^2 - 8$

$\boldsymbol{y = 2x^2 + 24x + 64}$

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

$\boldsymbol{y = 4x^2 - 40x + 102}$

Topic: Completing the square to write quadratic functions in vertex form.

Use an area model to figure out how to complete the square so the equation can be written in vertex form $\boldsymbol{(y = a(x - h)^2 + k)}$. Draw an area diagram like you created in class with Optima's quilt blocks. Write each equation in vertex form.

17. $y = x^2 + 10x + 2$

$\boldsymbol{y = (x + 5)^2 - 23}$

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

$\boldsymbol{y = \left(x + \frac{3}{2}\right)^2 - \frac{5}{4}}$

19. $y = x^2 + 6x + 5$

$\boldsymbol{y = (x + 3)^2 - 4}$

20. $y = x^2 + 8x + 26$

$\boldsymbol{y = (x + 4)^2 + 10}$

Go

Topic: Features of quadratic functions and graphing quadratic functions

For each quadratic function, identify the vertex, equation of axis of symmetry, domain, and range. Then complete the table of values with at least two symmetric values on each side of the vertex and graph the function.

21. $y = 2(x-4)^2 - 6$

Vertex: $(4, -6)$

Equation of Axis of Symmetry: $x = 4$

Domain: $(-\infty, \infty)$

Range: $[-6, \infty)$

Intervals of Increase/Decrease:

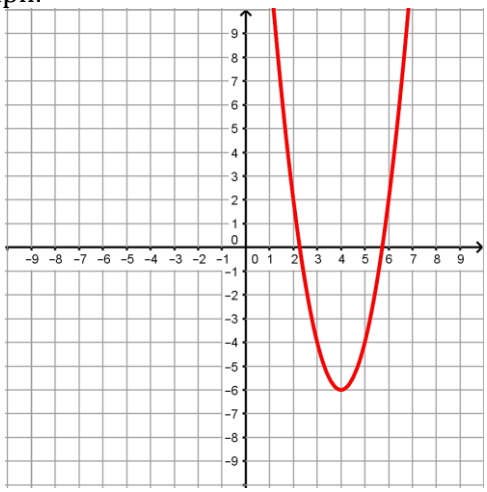
Increase: $(4, \infty)$

Decrease: $(-\infty, 4)$

Table of Values:

x	y
2	2
3	−4
4	−6
5	−4
6	2

Graph:



22. $y = -\frac{1}{3}(x+2)^2 + 4$

Vertex: $(-2, 4)$

Equation of Axis of Symmetry: $x = -2$

Domain: $(-\infty, \infty)$

Range: $(-\infty, 4]$

Intervals of Increase/Decrease:

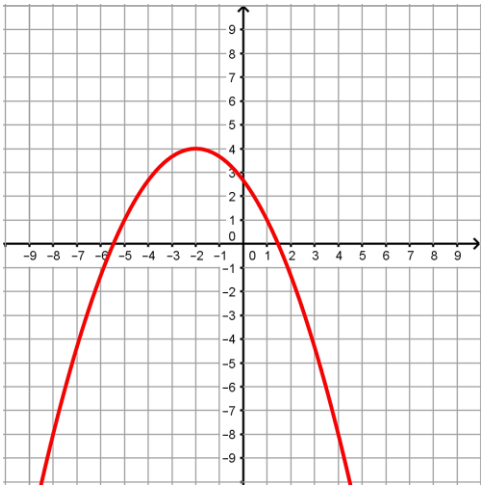
Increase: $(-\infty, -2)$

Decrease: $(-2, \infty)$

Table of Values:

x	y
−4	$2\frac{2}{3}$
−3	$3\frac{2}{3}$
−2	4
−1	$3\frac{2}{3}$
0	$2\frac{2}{3}$

Graph:



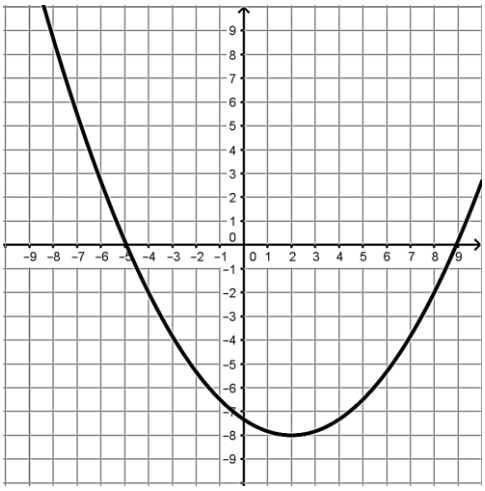
Topic: Writing quadratic functions in vertex form.

Use the given information to write the equation of each quadratic function in vertex form.

23. Vertex $(-4, 2)$ and passes through the point $(-2, -10)$

$\boldsymbol{y = -3(x+4)^2 + 2}$

24.



$\boldsymbol{y = \frac{3}{4}(x-2)^2 - 8}$

25.

x	y
-3	-91
-1	-41
1	-11
3	-1
5	-11

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

Topic: Finding y-intercepts

Find the y-intercept of each function. Hint: the y-intercept is the point where the function crosses the y-axis (when $x = 0$).

26. $3x - 8y = 32$

$\boldsymbol{(0, -4)}$

27. $y = 4x^2 - 8x + 12$

$\boldsymbol{(0, 12)}$

28. $y = -2(x+6)^2 + 9$

$\boldsymbol{(0, -63)}$

29. $y = 6(3)^x$

$\boldsymbol{(0, 6)}$

Name **Structures of Expressions** | **10.4H**

Ready, Set, Go!

Ready

Topic: Creating binomial quadratics

Multiply.

1. $x(4x-7)$
   $\mathbf{4x^2-7x}$

2. $5x(3x+8)$
   $\mathbf{15x^2+40x}$

3. Are the answers to problems 1 & 2 quadratics? Justify.
   Yes, they are both of the form ax^2+bx+c

4. Write a rule for factoring a quadratic, written in standard form ($\boldsymbol{ax^2+bx+c}$) when **c** equals 0.
   $\boldsymbol{ax^2+bx=x(ax+b)}$

Multiply.

5. $(x+9)(x-9)$
   $\mathbf{x^2-81}$

6. $(x+2)(x-2)$
   $\mathbf{x^2-4}$

7. $(6x+5)(6x-5)$
   $\mathbf{36x^2-25}$

8. $(7x+1)(7x-1)$
   $\mathbf{49x^2-1}$

9. The answers to problems 5, 6, 7, & 8 are quadratics. Which coefficient, **a, b,** or **c**, equals 0? Why does this coefficient equal 0?

   $b=0$ because the coefficients of the x terms (after multiplying the binomials) are opposites and cancel each other out.

10. Multiply $(x-13)(x+13)$ (Show all of your steps.) Then multiply $(x-13)(x-13)$.

    $\mathbf{x^2-169}$
    $\mathbf{x^2-26x+169}$

11. Multiply $(a-b)(a+b)$ (Show all of your steps.) Then multiply $(a+b)(a+b)$.

    $\boldsymbol{a^2-b^2}$
    $\boldsymbol{a^2+2ab+b^2}$

Set

Topic: Factoring quadratic expressions

Factor the following quadratic expressions into two binomials.

12. $x^2 - 4x - 45$

$(x - 9)(x + 5)$

13. $x^2 - 12x - 45$

$(x - 15)(x + 3)$

14. $x^2 - 44x - 45$

$(x - 45)(x + 1)$

15. $x^2 - x - 72$

$(x - 9)(x + 8)$

16. $x^2 + 14x - 72$

$(x - 4)(x + 18)$

17. $x^2 - 18x + 72$

$(x - 12)(x - 6)$

18. $x^2 - 12x + 36$

$(x - 6)(x - 6)$

19. $x^2 + 14x - 32$

$(x - 2)(x + 16)$

20. $x^2 - 15x + 36$

$(x - 3)(x - 12)$

21. $x^2 + 17x + 60$

$(x + 12)(x + 5)$

22. $x^2 - 11x - 60$

$(x + 4)(x - 15)$

23. $x^2 - 23x + 60$

$(x - 3)(x - 20)$

Go

Topic: Completing the square to write quadratic functions in vertex form and identifying features of quadratic functions.

Write each quadratic function in vertex form by completing the square. Then identify the vertex, equation of the axis of symmetry, and domain & range.

24. $y = x^2 + 10x + 23$

Vertex Form: $y = (x + 5)^2 - 2$
Equation of Axis of Symmetry: $x = -5$
Domain: $(-\infty, \infty)$
Range: $[-2, \infty)$
Interval of Increase: $(-5, \infty)$
Interval of Decrease: $(-\infty, -5)$

25. $y = x^2 - 16x + 50$

Vertex Form: $y = (x - 8)^2 - 14$
Equation of Axis of Symmetry: $x = 8$
Domain: $(-\infty, \infty)$
Range: $[-14, \infty)$
Interval of Increase: $(8, \infty)$
Interval of Decrease: $(-\infty, 8)$

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

Vertex Form: $y = (x - 3)^2 - 1$
Equation of Axis of Symmetry: $x = 3$
Domain: $(-\infty, \infty)$
Range: $[-1, \infty)$
Interval of Increase: $(3, \infty)$
Interval of Decrease: $(-\infty, 3)$

Topic: Converting from vertex form to standard form.

Convert each function written in vertex form into standard form.

27. $y = (x + 4)^2 + 9$

$\boldsymbol{y = x^2 + 8x + 25}$

28. $y = (x - 6)^2 - 4$

$\boldsymbol{y = x^2 - 12x + 32}$

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

$\boldsymbol{y = 2x^2 + 12x + 10}$

Name **Structures of Expressions** | **10.5H**

Ready, Set, Go!

Ready

Topic: Zero product property

Find the value(s) of x that make each product equal to 0.

1. $7x = 0$

   $\boldsymbol{x = 0}$

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

   $\boldsymbol{x = 4}$

3. $(x + 7)(3) = 0$

   $\boldsymbol{x = -7}$

4. $(x + 3)(6) = 0$

   $\boldsymbol{x = -3}$

5. $(x - 8)(9) = 0$

   $\boldsymbol{x = 8}$

6. $(2x + 1)(3) = 0$

   $\boldsymbol{x = -\frac{1}{2}}$

7. $(3x - 2)(5) = 0$

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

8. $(4x + 3)(2) = 0$

   $\boldsymbol{x = -\frac{3}{4}}$

9. $(2x - 5)(7) = 0$

   $\boldsymbol{x = \frac{5}{2}}$

10. Explain how you can find the value of x that makes the product equal to 0 without using distribution.
    Set the factor containing x equal to 0 and solve for x.

Set

Topic: Factoring quadratic expressions

Factor the following quadratic expressions into two binomials.

11. $x^2 - 36$

    $\boldsymbol{(x - 6)(x + 6)}$

12. $3x^2 - 2x - 5$

    $\boldsymbol{(3x - 5)(x + 1)}$

13. $2x^2 + 3x - 9$

    $\boldsymbol{(2x - 3)(x + 3)}$

14. $10x^2 - 19x + 6$

    $\boldsymbol{(5x - 2)(2x - 3)}$

15. $10x^2 - 11x - 6$

    $\boldsymbol{(5x + 2)(2x - 3)}$

16. $10x^2 - 7x - 6$

    $\boldsymbol{(5x - 6)(2x + 1)}$

17. $3x^2 - 8x + 4$

$\mathbf{(3x - 2)(x - 2)}$

18. $5x^2 + 19x + 12$

$\mathbf{(5x + 4)(x + 3)}$

19. $2x^2 + 11x + 5$

$\mathbf{(2x + 1)(x + 5)}$

20. $4x^2 - 35x + 49$

$\mathbf{(x - 7)(4x - 7)}$

21. $x^2 - 121$

$\mathbf{(x + 11)(x - 11)}$

22. $x^2 - 64$

$\mathbf{(x - 8)(x + 8)}$

23. $4x^2 - 9$

$\mathbf{(2x + 3)(2x - 3)}$

24. $64x^2 - 1$

$\mathbf{(8x + 1)(8x - 1)}$

25. $6x^2 + 7x - 49$

$\mathbf{(3x - 7)(2x + 7)}$

Go

Topic: Converting between standard form, vertex form, and factored forms.

Convert each function into the other two forms indicated. Hint: In order to go from vertex form to factored form, write function in standard form first.

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

Vertex Form: $\mathbf{y = (x - 3)^2 - 16}$

Factored Form: $\mathbf{y = (x - 7)(x + 1)}$

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

Standard Form: $\mathbf{y = x^2 + 8x + 7}$

Factored Form: $\mathbf{y = (x + 7)(x + 1)}$

28. $y = (x + 8)(x - 2)$

Standard Form: $\mathbf{y = x^2 + 6x - 16}$

Vertex Form: $\mathbf{y = (x + 3)^2 - 25}$

Name **Structures of Expressions** | **10.6H**

Ready, Set, Go!

Ready

Topic: Multiplying binomials using a two-way table.

Multiply the following binomials using the given two-way table to assist you.

Example:

Multiply $(2x+3)(5x-7)$

	$5x$	-7
$2x$	$10x^2$	$-14x$
$+3$	$+15x$	-21

$= 10x^2 + x - 21$

1. $(3x-4)(7x-5)$

	$3x$	-4
$7x$	$21x^2$	$-28x$
-5	$-15x$	20

$21x^2 - 43x + 20$

2. $(9x+2)(x+6)$

	$9x$	2
x	$9x^2$	$2x$
6	$54x$	12

$9x^2 + 56x + 12$

3. $(4x-3)(3x+11)$

	$4x$	-3
$3x$	$12x^2$	$-9x$
11	$44x$	-33

$12x^2 + 35x - 33$

4. $(7x+3)(7x-3)$

	$7x$	3
$7x$	$49x^2$	$21x$
-3	$-21x$	-9

$49x^2 - 9$

5. $(3x-10)(3x+10)$

	$3x$	-10
$3x$	$9x^2$	$-30x$
10	$30x$	-100

$9x^2 - 100$

6. $(11x+5)(11x-5)$

	$11x$	5
$11x$	$121x^2$	$55x$
-5	$-55x$	-25

$121x^2 - 25$

7. $(4x+5)^2$

	$4x$	5
$4x$	$16x^2$	$20x$
5	$20x$	25

$16x^2 + 40x + 25$

8. $(x+9)^2$

	x	9
x	x^2	$9x$
9	$9x$	81

$x^2 + 18x + 81$

9. $(10x-7)^2$

	$10x$	-7
$10x$	$100x^2$	$-70x$
-7	$-70x$	49

$100x^2 - 140x + 49$

10. What do you notice in the "like-term" boxes in #'s 7, 8, and 9 that is different from the other problems?

The "like-terms" in the boxes for questions 7, 8 and 9 are same, whereas the "like-terms" in the other problems are opposites.

Set

Topic: Factored form of a quadratic function

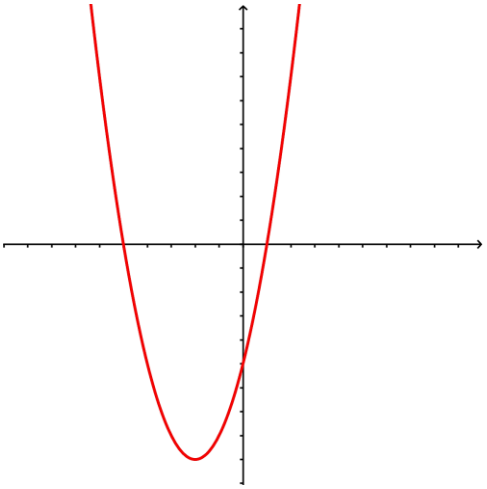
Given the factored form of a quadratic function, identify the *x*-intercepts and the vertex of the function. Write these functions in both standard and vertex forms. Then use the *x*-intercepts and the vertex to sketch a graph of the function.

11. $y = (x - 1)(x + 5)$

x-intercepts: $\mathbf{1, -5}$ Vertex: $\mathbf{(-2, -9)}$

Standard Form: $\boldsymbol{y = x^2 + 4x - 5}$

Vertex Form: $\boldsymbol{y = (x + 2)^2 - 9}$

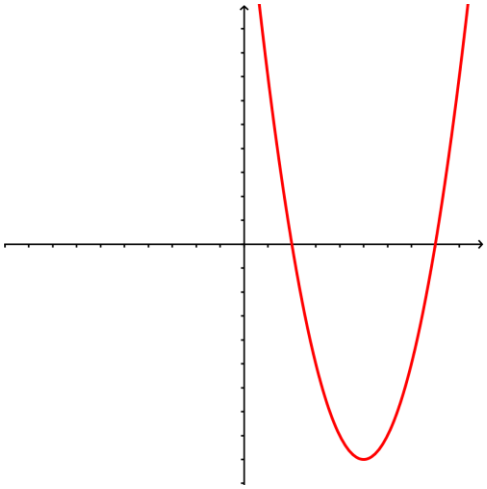


12. $y = (x - 2)(x - 8)$

x-intercepts: $\mathbf{-2, 8}$ Vertex: $\mathbf{(5, -9)}$

Standard Form: $\boldsymbol{y = x^2 - 10x + 16}$

Vertex Form: $\boldsymbol{y = (x - 5)^2 - 9}$

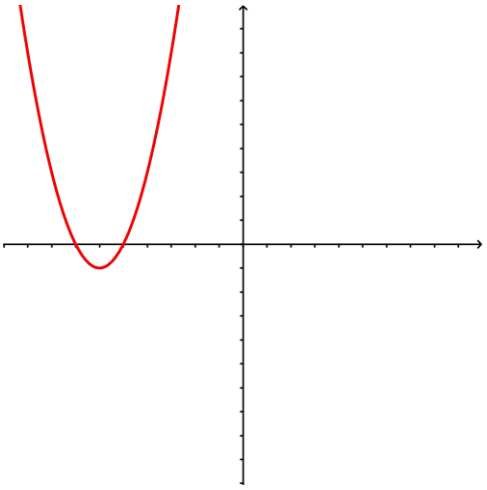


13. $y = (x + 5)(x + 7)$

x-intercepts: $\mathbf{-5, -7}$ Vertex: $\mathbf{(-6, -1)}$

Standard Form: $\boldsymbol{y = x^2 + 12x + 35}$

Vertex Form: $\boldsymbol{y = (x + 6)^2 - 1}$

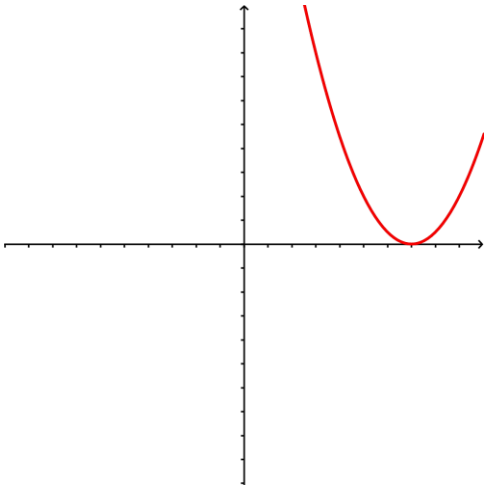


14. $y = \frac{1}{2}(x - 7)(x - 7)$

x-intercepts: $\mathbf{7}$ Vertex: $\mathbf{(7, 0)}$

Standard Form: $\boldsymbol{y = \frac{1}{2}x^2 - 7x + \frac{49}{2}}$

Vertex Form: $\boldsymbol{y = \frac{1}{2}(x - 7)^2}$

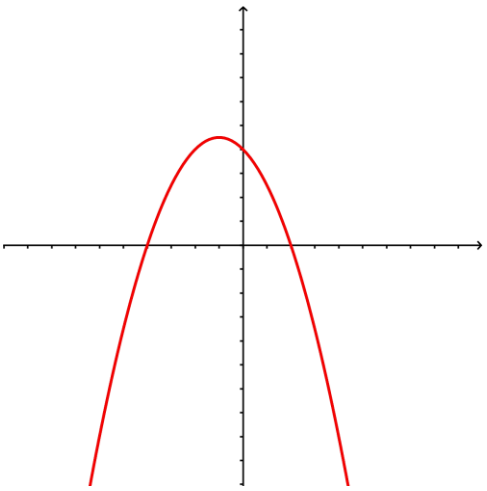


15. $y = -\frac{1}{2}(x-2)(x+4)$

x-intercepts: $\mathbf{2, -4}$ Vertex: $\left(\mathbf{-1, \frac{9}{2}}\right)$

Standard Form: $\boldsymbol{y = -\frac{1}{2}x^2 - x + 4}$

Vertex Form: $\boldsymbol{y = -\frac{1}{2}(x+1)^2 + \frac{9}{2}}$

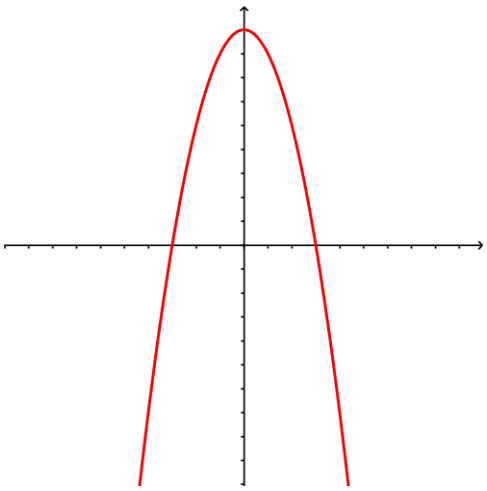


16. $y = -(x-3)(x+3)$

x-intercepts: $\mathbf{3, -3}$ Vertex: $\mathbf{(0, 9)}$

Standard Form: $\boldsymbol{y = -x^2 + 9}$

Vertex Form: $\boldsymbol{y = -x^2 + 9}$

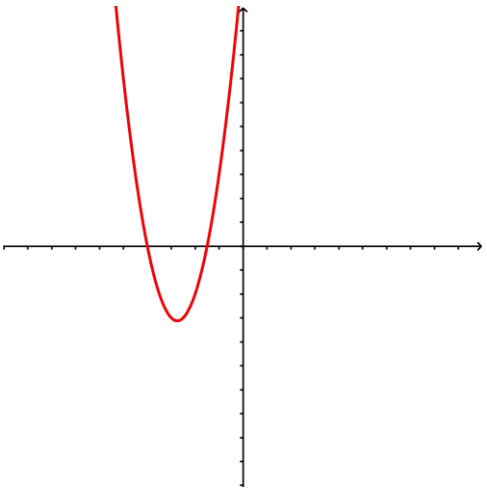


17. $y = (2x+3)(x+4)$

x-intercepts: $\mathbf{-4, -\frac{3}{2}}$ Vertex: $\left(\mathbf{-\frac{11}{4}, -\frac{25}{8}}\right)$

Standard Form: $\boldsymbol{y = 2x^2 + 11x + 12}$

Vertex Form: $\boldsymbol{y = 2\left(x + \frac{11}{4}\right)^2 - \frac{25}{8}}$

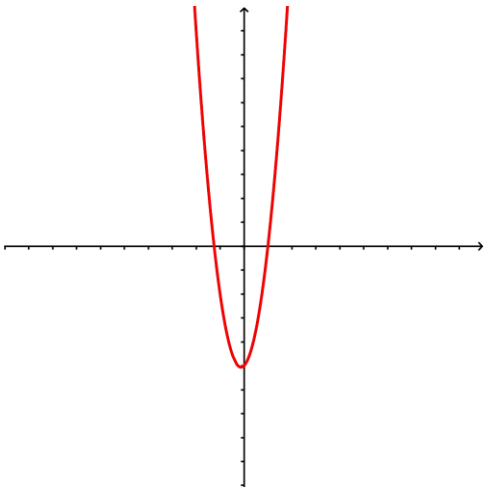


18. $y = (4x+5)(x-1)$

x-intercepts: $\mathbf{1, -\frac{5}{4}}$ Vertex: $\left(\mathbf{-\frac{1}{8}, -\frac{81}{16}}\right)$

Standard Form: $\boldsymbol{y = 4x^2 + x - 5}$

Vertex Form: $\boldsymbol{y = 4\left(x + \frac{1}{8}\right)^2 - \frac{81}{16}}$



19. Convert each standard form equation into factored form and vertex form.

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

Factored Form: $\boldsymbol{y = (x - 1)(x + 5)}$

Vertex Form: $\boldsymbol{y = (x + 2)^2 - 9}$

b. $y = x^2 - 10x + 16$

Factored Form: $\boldsymbol{y = (x - 2)(x - 8)}$

Vertex Form: $\boldsymbol{y = (x - 5)^2 - 9}$

c. $y = x^2 + 12x + 35$

Factored Form: $\boldsymbol{y = (x + 5)(x + 7)}$

Vertex Form: $\boldsymbol{y = (x + 6)^2 - 1}$

Go

Topic: Factoring quadratic expressions.

Factor each expression complete. Don't be afraid to use the area model to help you factor each expression. Hint: If there all the terms have a number in common (a greatest common factor), then factor this number out of every term first and then factor the remaining quadratic expression.

20. $x^2 - 17x + 72$
$\boldsymbol{(x - 8)(x - 9)}$

21. $2x^2 - 4x - 48$
$\boldsymbol{2(x + 4)(x - 6)}$

22. $x^2 - 16$
$\boldsymbol{(x + 4)(x - 4)}$

23. $2x^2 + 19x + 24$
$\boldsymbol{(2x + 3)(x + 8)}$

24. $3x^2 + 17x - 6$
$\boldsymbol{(3x - 1)(x + 6)}$

25. $6x^2 - 9x - 15$
$\boldsymbol{3(2x - 5)(x + 1)}$

Name **Structures of Expressions** | **10.7H**

Ready, Set, Go!

Ready

Topic: Writing functions in vertex form.

Write each function in vertex form. Identify the vertex, axis of symmetry, direction of opening, and the domain and range of each function.

1. $y = x^2 + 4x - 21$

Vertex Form: $\boldsymbol{y = (x + 2)^2 - 25}$

Vertex: $\boldsymbol{(-2, -25)}$

Direction of Opening: **up**

Domain: $(-\infty, \infty)$

Range: $\boldsymbol{[-25}, \infty)$

2. $y = (x + 7)(x + 9)$

Vertex Form: $\boldsymbol{y = (x + 8)^2 - 1}$

Vertex: $\boldsymbol{(-8, -1)}$

Direction of Opening: **up**

Domain: $(-\infty, \infty)$

Range: $\boldsymbol{[-1}, \infty)$

3. $y = -(x - 15)(x + 3)$

Vertex Form: $\boldsymbol{y = -(x - 6)^2 + 81}$

Vertex: $\boldsymbol{(6,\ 81)}$

Direction of Opening: **down**

Domain: $(-\infty, \infty)$

Range: $(-\infty, \boldsymbol{81}]$

4. $y = x^2 + 2x - 35$

Vertex Form: $\boldsymbol{y = (x + 1)^2 - 36}$

Vertex: $\boldsymbol{(-1, -36)}$

Direction of Opening: **up**

Domain: $(-\infty, \infty)$

Range: $\boldsymbol{[-36}, \infty)$

Set

Topic: Graphing and writing equations of quadratic functions

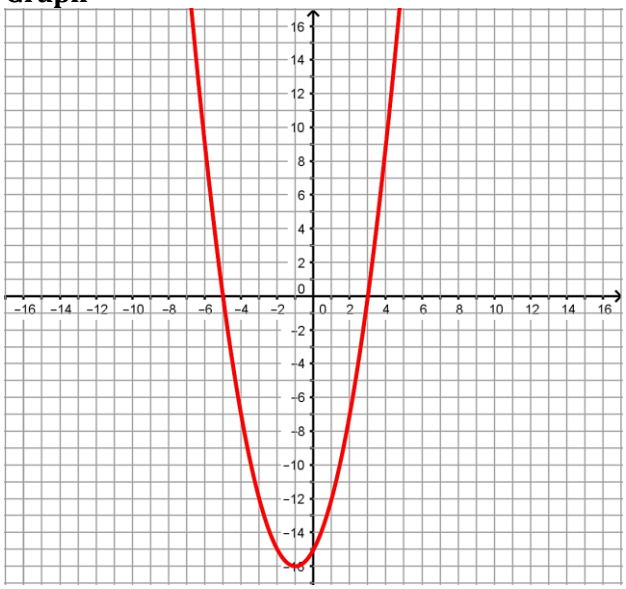
One form of a quadratic function is given. Fill in the missing forms.

5. **Standard form:** $y = x^2 + 2x - 15$ **Vertex form:** $y = (x+1)^2 - 16$ **Factored form:** $y = (x+5)(x-3)$

Table (Show the vertex and at least 2 points on each side of the vertex.)

x	y
-3	-12
-2	-15
-1	-16
0	-15
1	-12

Graph

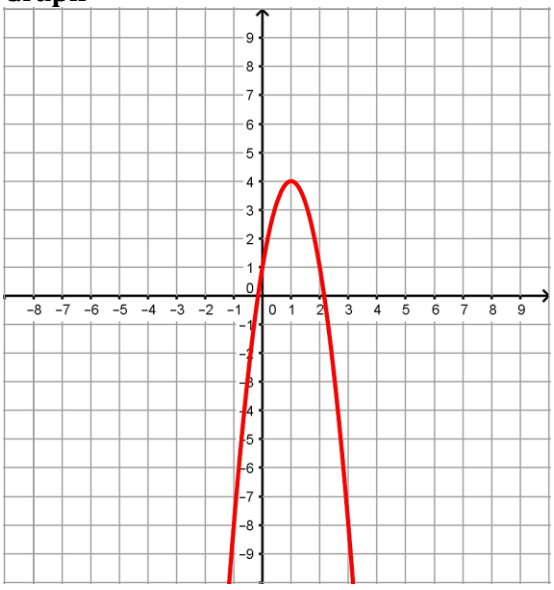


6. **Standard form:** $y = -3x^2 + 6x + 1$ **Vertex form:** $y = -3(x-1)^2 + 4$ **Factored form:** does not factor

Table (Show the vertex and at least 2 points on each side of the vertex.)

x	y
-1	-8
0	1
1	4
2	1
3	-8

Graph



7. **Standard form:** $y = -x^2 + 10x - 25$

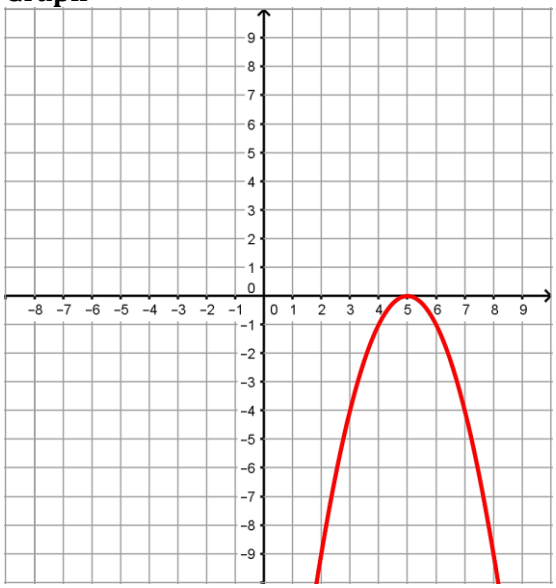
Vertex form: $\boldsymbol{y = -(x-5)^2}$

Factored form: $\boldsymbol{y = -(x-5)^2}$

Table (Show the vertex and at least 2 points on each side of the vertex.)

x	y
3	**−4**
4	**−1**
5	**0**
6	**−1**
7	**−4**

Graph



8. **Standard form:** $\boldsymbol{y = 2x^2 + 20x + 48}$

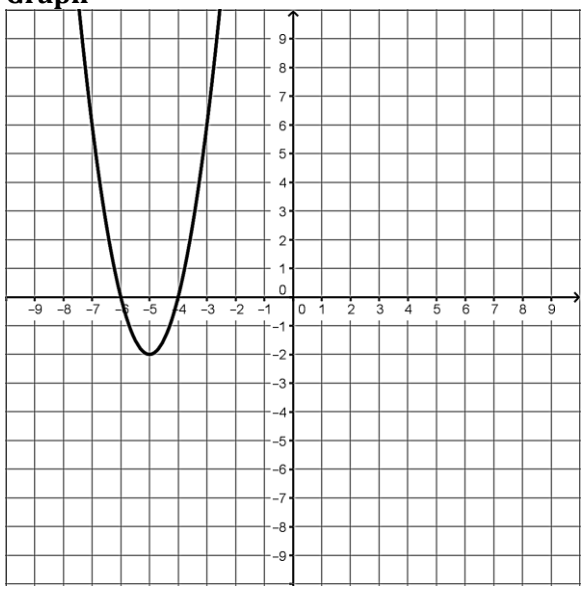
Vertex form: $\boldsymbol{y = 2(x+5)^2 - 2}$

Factored form: $\boldsymbol{y = 2(x+6)(x+4)}$

Table (Show the vertex and at least 2 points on each side of the vertex.)

x	y
−7	**6**
−6	**0**
−5	**−2**
−4	**0**
−3	**6**

Graph



Go

Topic: Converting between three forms of quadratic functions.

Convert the given function into the indicated forms (standard, vertex, and/or factored forms).

9. $y = x^2 + 12x - 64$

Factored Form: $\boldsymbol{y = (x + 16)(x - 4)}$

Vertex Form: $\boldsymbol{y = (x + 6)^2 - 100}$

10. $y = x^2 - 64$

Factored Form: $\boldsymbol{y = (x + 8)(x - 8)}$

Vertex Form: $\boldsymbol{y = x^2 - 64}$

11. $y = 3x^2 + 24x + 49$

Vertex Form: $\boldsymbol{y = 3(x + 4)^2 + 1}$

12. $y = 2x^2 - 12x + 23$

Vertex Form: $\boldsymbol{y = 2(x - 3)^2 + 5}$

13. $y = 2(x + 8)(x - 2)$

Standard Form: $\boldsymbol{y = 2x^2 + 12x - 32}$

Vertex Form: $\boldsymbol{y = 2(x + 3)^2 - 50}$

14. $y = (x - 5)(x + 3)$

Standard Form: $\boldsymbol{y = x^2 - 2x - 15}$

Vertex Form: $\boldsymbol{y = (x - 1)^2 - 16}$

15. $y = (x + 2)^2 - 16$

Standard Form: $\boldsymbol{y = x^2 + 4x - 12}$

Factored Form: $\boldsymbol{y = (x + 6)(x - 2)}$

16. $y = (x - 4)^2 - 81$

Standard Form: $\boldsymbol{y = x^2 - 8x - 65}$

Factored Form: $\boldsymbol{y = (x - 13x)(x + 5)}$

Topic: Factoring quadratic expressions.

Factor the following quadratic expressions, if possible.

17. $x^2 - 5x + 6$

$\boldsymbol{(x - 2)(x - 3)}$

18. $x^2 - 7x + 6$

$\boldsymbol{(x - 6)(x - 1)}$

19. $m^2 + 16m + 63$

$\boldsymbol{(m + 9)(m + 7)}$

20. $2x^2 - 17x + 30$

$\boldsymbol{(2x - 5)(x - 6)}$

21. $12n^2 - 8n + 1$

$\boldsymbol{(6n - 1)(2n - 1)}$

22. 18. $3x^2 + 11x + 10$

$\boldsymbol{(3x + 5)(x + 2)}$

23. $36x^2 + 84x + 49$

$\boldsymbol{(6x + 7)^2}$

24. $64x^2 - 9$

$\boldsymbol{(8x + 3)(8x - 3)}$

25. $25x^2 + 20x + 4$

$\boldsymbol{(5x + 2)^2}$