

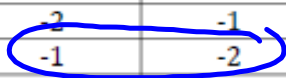
Questions on 2.2 HW? 2.1 HW is due today...

Check your answers:

3.

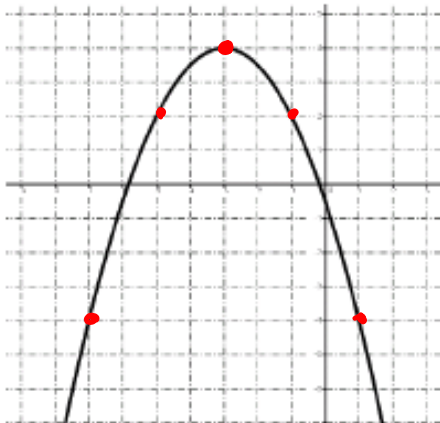
x	$f(x)$
-4	7
-3	2
-2	-1
-1	-2
0	-1
1	2
2	7
3	14
4	23

vertex



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

4.

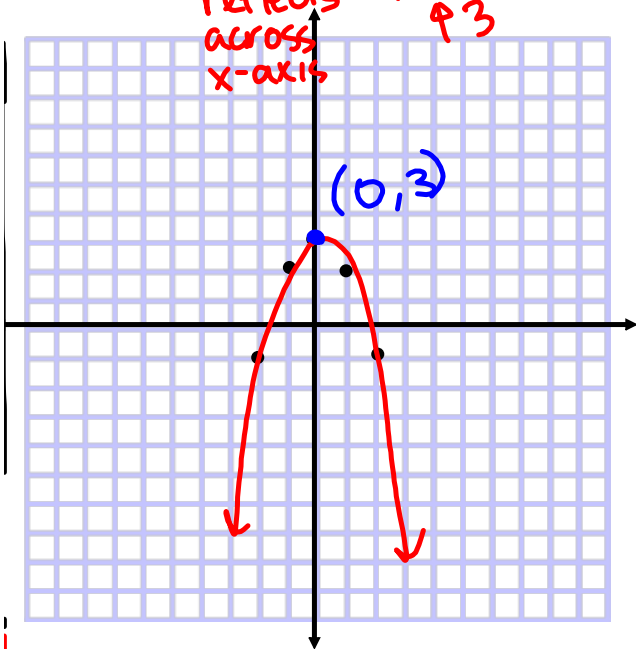


$$f(x) = (-1/2)(x + 3)^2 + 4$$

Graph each equation without using technology. Be sure to have the exact vertex and at least two correct points on either side of the line of symmetry.

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

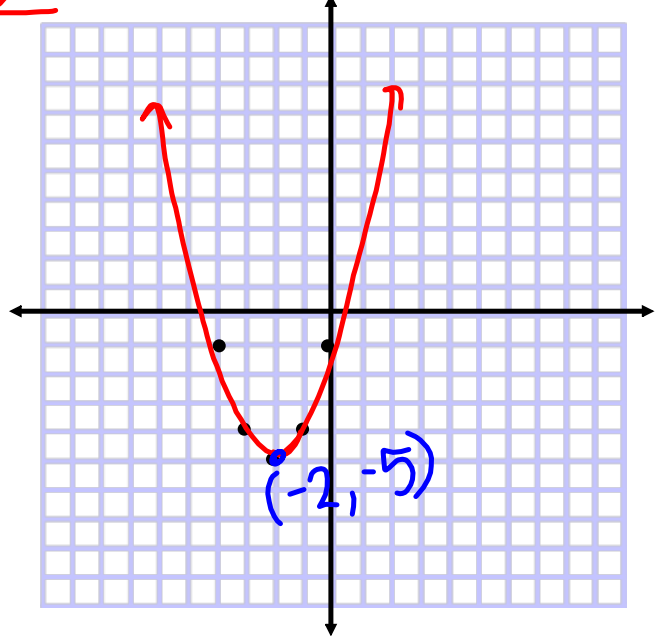
reflects across x-axis
moves up 3



$y = x^2$

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

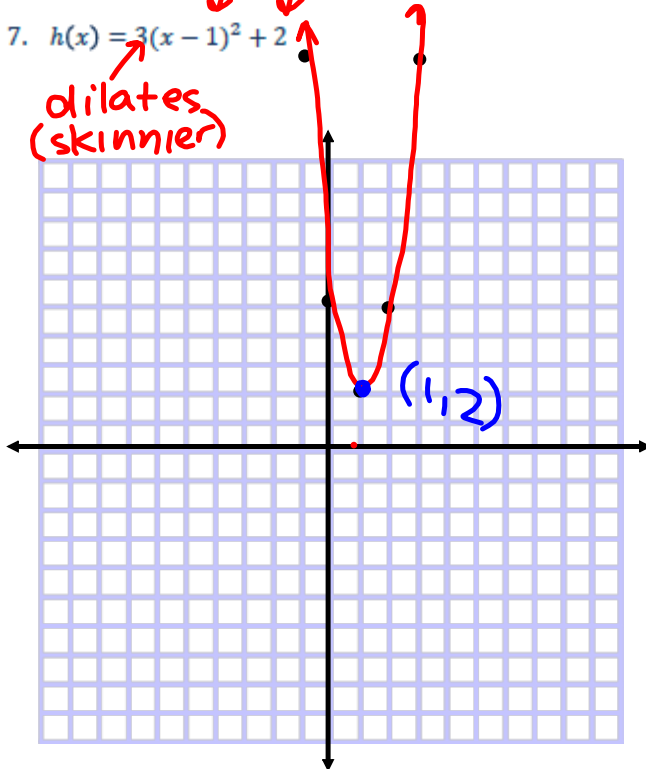
← 2 ↓ 5



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

dilates (skinnier)

→ 1 ↑ 2



8. Given: $f(x) = a(x - h)^2 + k$

a. What point is the vertex of the parabola?

(h, k)

b. What is the equation of the line of symmetry?

$x = h$

c. How can you tell if the parabola opens up or down?

$a < 0$, open down

$a > 0$, open up

d. How do you identify the dilation?

$0 < a < 1$, wider.

$a > 1$, skinnier

9. Does it matter in which order the transformations are done? Explain why or why not.

No, the points will be the same.

standard form of a quadratic equation is defined as $y = ax^2 + bx + c$, ($a \neq 0$).
 Identify a, b, and c in the following equations.

Example: Given $4x^2 + 7x - 6$, $a = 4$, $b = 7$, and $c = -6$

1. $y = 5x^2 + 3x + 6$

2. $y = x^2 - 7x + 3$

$a =$ _____
 $b =$ _____
 $c =$ _____

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

$a =$ _____
 $b =$ _____
 $c =$ _____

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

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

$a =$ _____
 $b =$ _____
 $c =$ _____

6. $y = 8x^2 - 5x - 2$

$a =$ 8
 $b =$ -5
 $c =$ -2

Multiply and write each product in the form $y = ax^2 + bx + c$. Then identify a, b, and c.

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

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

$a =$ _____
 $b =$ _____
 $c =$ _____

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

$a =$ 9
 $b =$ 0
 $c =$ -4

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

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

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

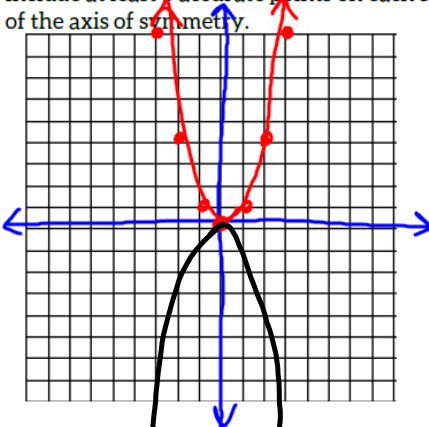
12. $y = -(x + 5)^2 = - (x + 5)(x + 5)$

$a = 1$
 $b = 10$
 $c = 25$

$= x^2 + 5x + 5x + 25$
 $= x^2 + 10x + 25$

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Topic: Graphing a standard $y = x^2$ parabola
13. Graph the equation $y = x^2$.
 Include at least 3 accurate points on each side of the axis of symmetry.



a. State the vertex of the parabola.
 b. Complete the table of values for $y = x^2$.

x	$f(x)$
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9

$(-3)^2$
 $(-2)^2$
 $(-1)^2$
 $(0)^2$
 $(1)^2$
 $(2)^2$
 $(3)^2$

Topic: Writing the equation of a transformed parabola in vertex form.
 Find a value for ω such that the graph will have the specified number of x-intercepts.

- 14. $y = x^2 + \omega$
2 (x-intercepts)
- 15. $y = x^2 + \omega$
1 (x-intercept)
 $x^2 + 0$
- 16. $y = x^2 + \omega$
no (x-intercepts)
- 17. $y = -x^2 + \omega$
2 (x-intercepts)
 $-x^2 + 3$
- 18. $y = -x^2 + \omega$
1 (x-intercept)
- 19. $y = -x^2 + \omega$
no (x-intercepts)

Graph the following equations. State the vertex.
 (Be accurate with your key points and shape!)

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


26.	<table border="1"><tr><th>x</th><th>y</th></tr><tr><td>-4</td><td>10</td></tr><tr><td>-3</td><td>3</td></tr><tr><td>-2</td><td>-2</td></tr><tr><td>-1</td><td>-5</td></tr><tr><td>0</td><td>-6</td></tr><tr><td>1</td><td>-5</td></tr><tr><td>2</td><td>-2</td></tr></table>	x	y	-4	10	-3	3	-2	-2	-1	-5	0	-6	1	-5	2	-2
x	y																
-4	10																
-3	3																
-2	-2																
-1	-5																
0	-6																
1	-5																
2	-2																
a.	Vertex: _____																
b.	AoS: _____																
c.	x-int(s): _____																
d.	MIN or MAX																

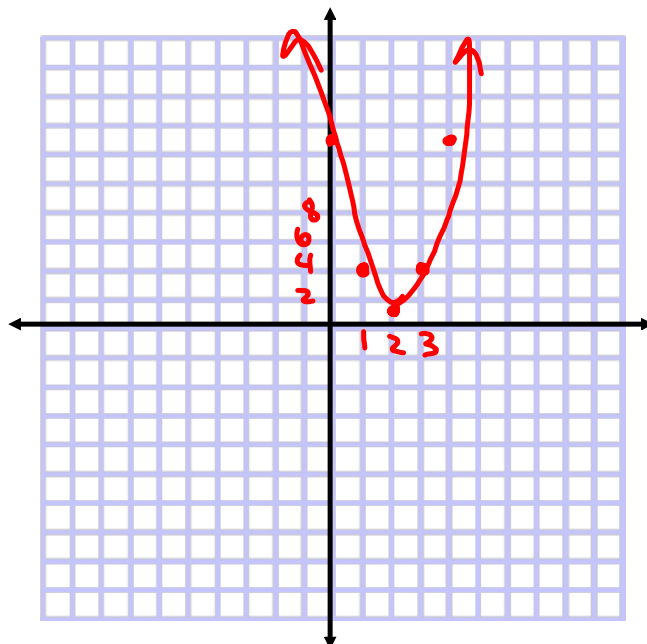
27.	<table border="1"><tr><th>x</th><th>y</th></tr><tr><td>-2</td><td>49</td></tr><tr><td>-1</td><td>28</td></tr><tr><td>0</td><td>13</td></tr><tr><td>1</td><td>4</td></tr><tr><td>2</td><td>1</td></tr><tr><td>3</td><td>4</td></tr><tr><td>4</td><td>13</td></tr></table>	x	y	-2	49	-1	28	0	13	1	4	2	1	3	4	4	13
x	y																
-2	49																
-1	28																
0	13																
1	4																
2	1																
3	4																
4	13																
a.	Vertex: (2,1)																
b.	AoS: $x=2$																
c.	x-int(s): none																
d.	MIN or MAX																

28.	<table border="1"><tr><th>x</th><th>y</th></tr><tr><td>-7</td><td>-9</td></tr><tr><td>-6</td><td>3</td></tr><tr><td>-5</td><td>7</td></tr><tr><td>-4</td><td>3</td></tr><tr><td>-3</td><td>-9</td></tr><tr><td>-2</td><td>-29</td></tr><tr><td>-1</td><td>-57</td></tr></table>	x	y	-7	-9	-6	3	-5	7	-4	3	-3	-9	-2	-29	-1	-57
x	y																
-7	-9																
-6	3																
-5	7																
-4	3																
-3	-9																
-2	-29																
-1	-57																
a.	Vertex: _____																
b.	AoS: _____																
c.	x-int(s): _____																
d.	MIN or MAX																

29.	<table border="1"><tr><th>x</th><th>y</th></tr><tr><td>-8</td><td>-9</td></tr><tr><td>-7</td><td>-8</td></tr><tr><td>-6</td><td>-9</td></tr><tr><td>-5</td><td>-12</td></tr><tr><td>-4</td><td>-17</td></tr><tr><td>-3</td><td>-24</td></tr><tr><td>-2</td><td>-33</td></tr></table>	x	y	-8	-9	-7	-8	-6	-9	-5	-12	-4	-17	-3	-24	-2	-33
x	y																
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a.	Vertex: _____																
b.	AoS: _____																
c.	x-int(s): _____																
d.	MIN or MAX																

SECONDARY II // MODULE 2
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 mathematics vision project



STRUCTURES OF EXPRESSIONS

2.3 BUILDING THE PERFECT SQUARE

A Develop Understanding Task

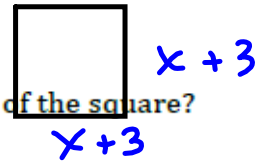


Quadratic Quilts

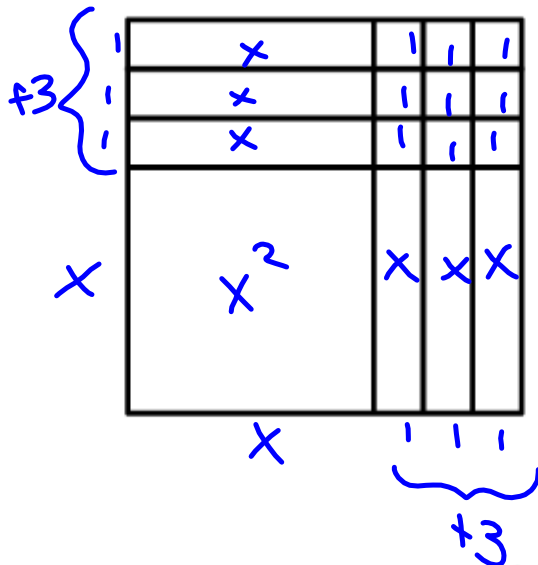
Optima has a quilt shop where she sells many colorful quilt blocks for people who want to make their own quilts. She has quilt designs that are made so that they can be sized to fit any bed. She bases her designs on quilt squares that can vary in size, so she calls the length of the side for the basic square x , and the area of the basic square is the function $A(x) = x^2$. In this way, she can customize the designs by making bigger squares or smaller squares.

1. If Optima adds 3 inches to the side of the square, what is the area of the square?

$$A(x) = (x + 3)^2$$



When Optima draws a pattern for the square in problem #1, it looks like this:



2. Use both the diagram and the equation, $A(x) = (x + 3)^2$ to explain why the area of the quilt block square, $A(x)$, is also equal to $x^2 + 6x + 9$.

Total area is $x^2 + 3x + 3x + 9$, just like

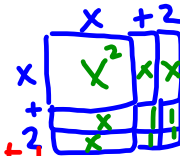
$$(x+3)^2 = (x+3)(x+3) = x^2 + 3x + 3x + 9 = x^2 + 6x + 9.$$

The customer service representatives at Optima's shop work with customer orders and write up the orders based on the area of the fabric needed for the order. As you can see from problem #2 there are two ways that customers can call in and describe the area of the quilt block. One way describes the length of the sides of the block and the other way describes the areas of each of the four sections of the block.

For each of the following quilt blocks, draw the diagram of the block and write two equivalent equations for the area of the block.

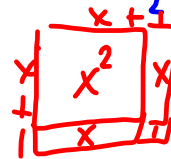
3. Block with side length: $x + 2$.

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



4. Block with side length: $x + 1$.

$$A(x) = (x+1)^2 = x^2 + 2x + 1$$



5. What patterns do you notice when you relate the diagrams to the two expressions for the area?

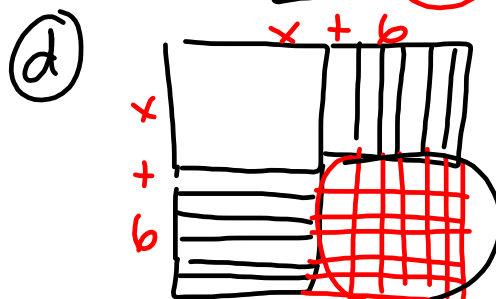
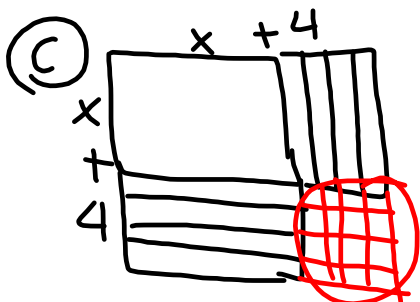
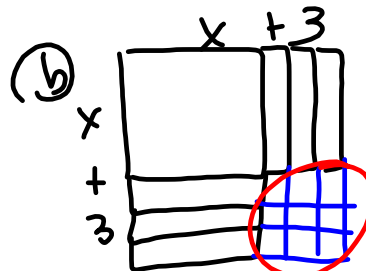
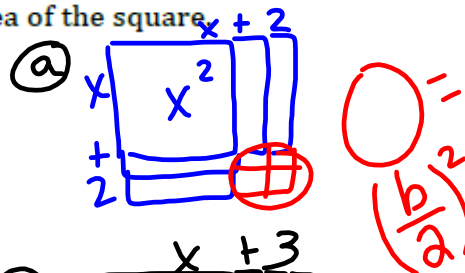
6. Optima likes to have her little dog, Clementine, around the shop. One day the dog got a little hungry and started to chew up the orders. When Optima found the orders, one of them was so chewed up that there were only partial expressions for the area remaining. Help Optima by completing each of the following expressions for the area so that they describe a perfect square. Then, write the two equivalent equations for the area of the square.

a. $x^2 + 4x + 4$

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

c. $x^2 + 8x + 16$

d. $x^2 + 12x + 36$



7. If $x^2 + bx + c$ is a perfect square, what is the relationship between b and c ?
How do you use b to find c , like in problem 6?

$$c = \left(\frac{b}{2}\right)^2$$

Will this strategy work if b is negative? Why or why not?

Yes, we just have to show the x 's are negative. We will still be adding c .

Will the strategy work if b is an odd number? What happens to c if b is odd?

Yes it still works; c will be a fraction/decimal if b is odd.

Homework

Finish 2.3 "Ready, Set, Go"