Section 4.1 Quadratic Families

- Define families of Functions
- Describe the Quadratic family
- Translations of the Quadratic family

Family of functions

- graphs have the same characteristics (look similar)

- have the same parent

parent function ⇒ Basic function
- members are transformations

Linear Family

parent $y = x$

Characteristics ⇒ slope (stretch - dilation)

y-int (vert shift)

Point-slope form (translation) $y = b(x-h)+k$

Quadratic family

Parent $y = x^2$

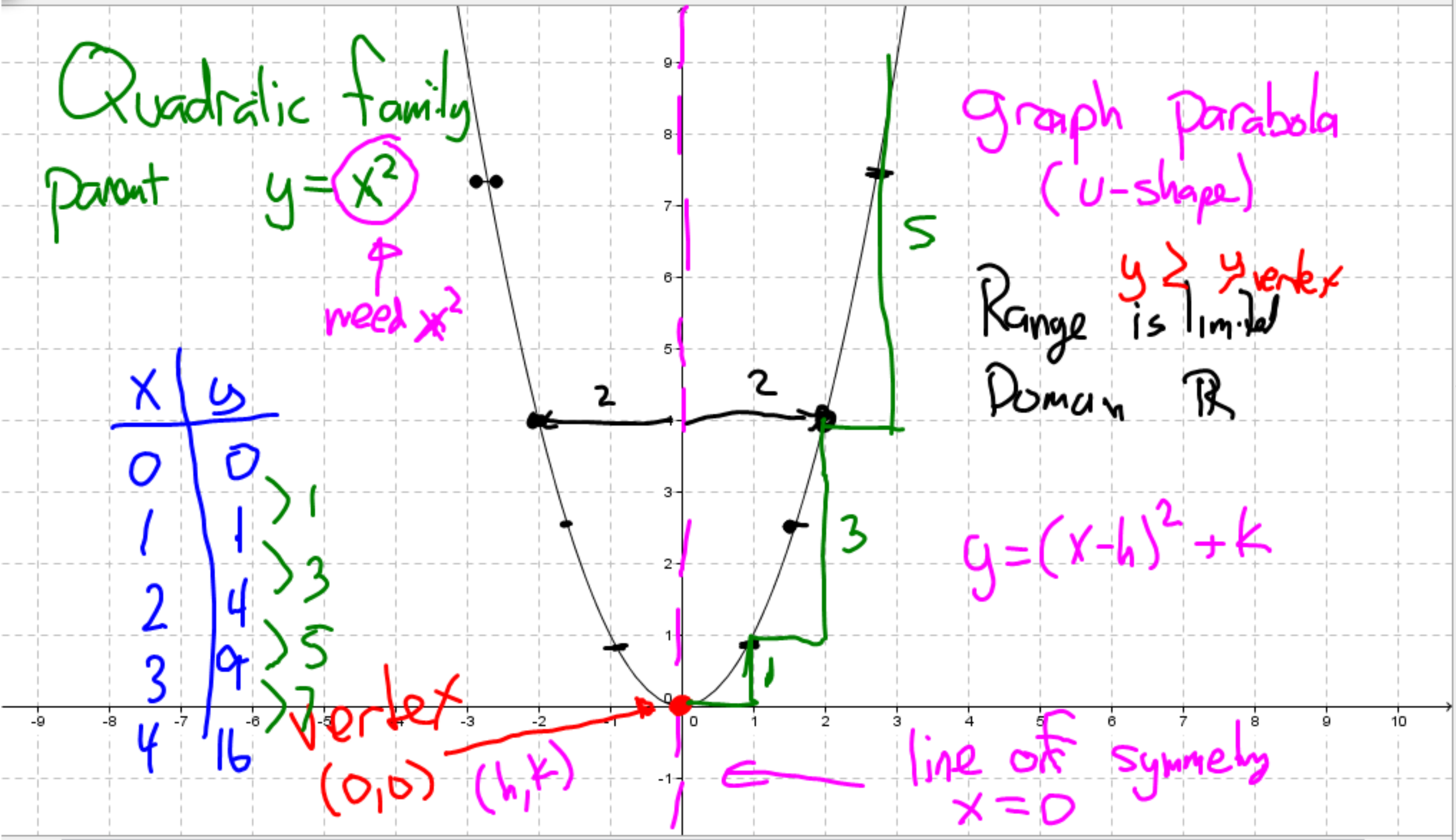
need x^2

x	y
0	0
1	1
2	4
3	9
4	16

graph parabola (U-shape)

Range is limited $y \geq y_{vertex}$

Domain $\mathbb{R}$



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

Input:

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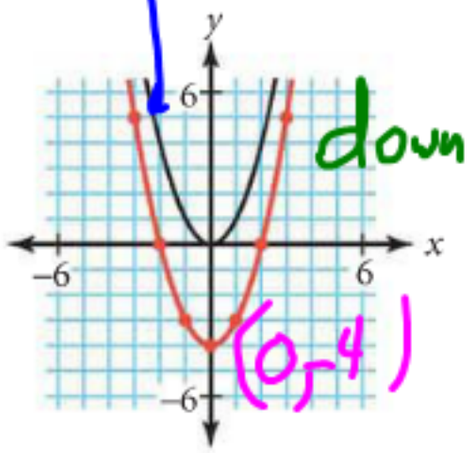
vertex

Step 1 | Each graph below shows the graph of the parent function $y = x^2$ in black. Find a quadratic equation that produces the congruent, red parabola. Apply what you learned about translations of the graphs of functions in Lesson 4.3.

$y = f(x) = x^2$

a.



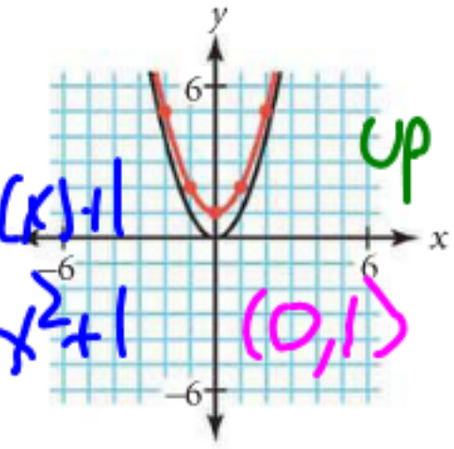
down 4

$y = f(x) - 4$

$y = x^2 - 4$

(0, −4)

b.



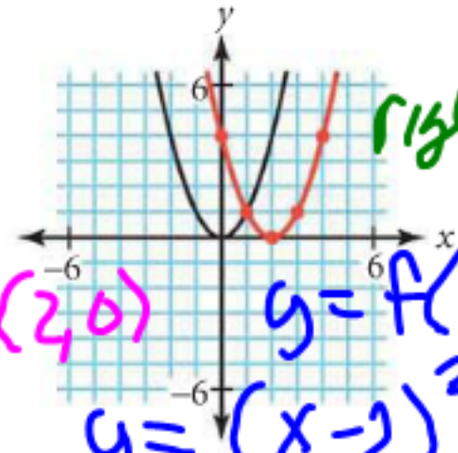
up 1

$y = f(x) + 1$

$y = x^2 + 1$

(0, 1)

c.



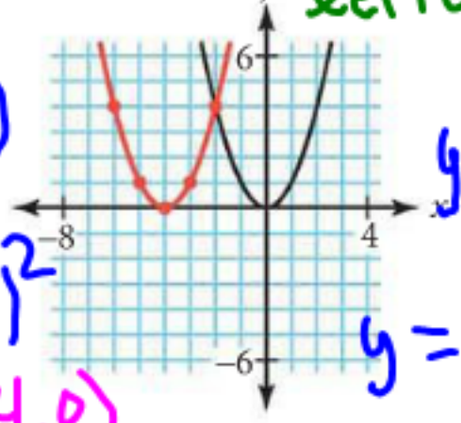
right 2

(2, 0)

$y = f(x - 2)$

$y = (x - 2)^2$

d.



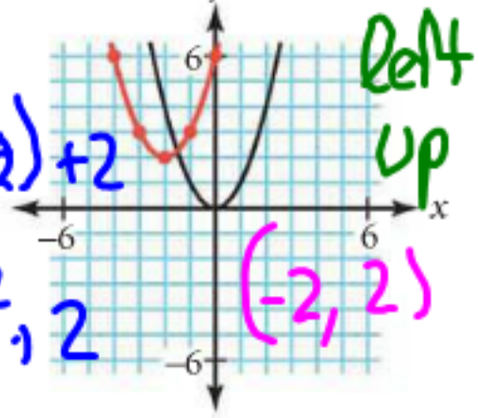
left 4

$y = f(x + 4)$

$y = (x + 4)^2$

(−4, 0)

e.



left 2

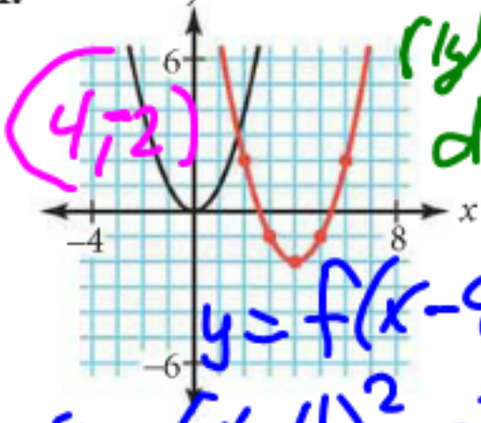
up 2

$y = f(x + 2) + 2$

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

(−2, 2)

f.



right 4

down 2

(4, −2)

$y = f(x - 4) - 2$

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

Section 4.1 Quadratic Families

- Define families of Functions
- Describe the Quadratic family
- Translations of the Quadratic family

Families of Functions ⇒ - eqns look similar
- graphs look similar
- similar characteristics

parent function (simplest function)

- offspring ⇒ all transformations of the parent.

Linear Family

parent $y = x$

graph ⇒ line

characteristics

slope = vert stretch (dilation)

y-int = vert translation

Quadratic Family

parent $y = x^2$

Domain $\mathbb{R}$

Range $y \geq 0$ (limited range)

x	y	
0	0	1
1	1	3
2	4	5
3	9	7
4	16	

General

Vertex (h, k)

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

graph

Parabola

5

BOGO

2 2

3

1

1a

vertex

(0,0)

line of symmetry

$x = 0$

Input:

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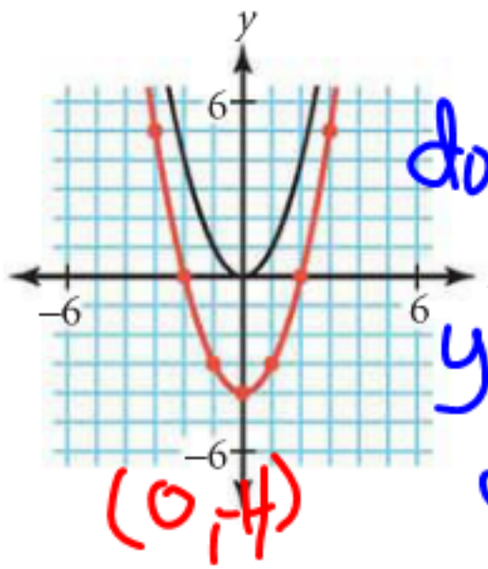
10/18/2016

Parent $y = x^2$

a.



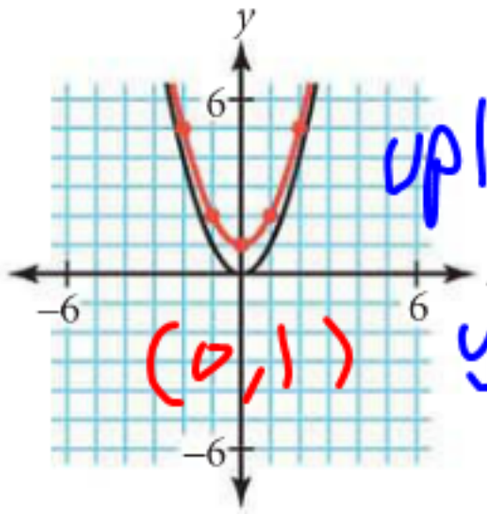
down 4

$y+4 = x^2$

$y = x^2 - 4$

(0, −4)

b.



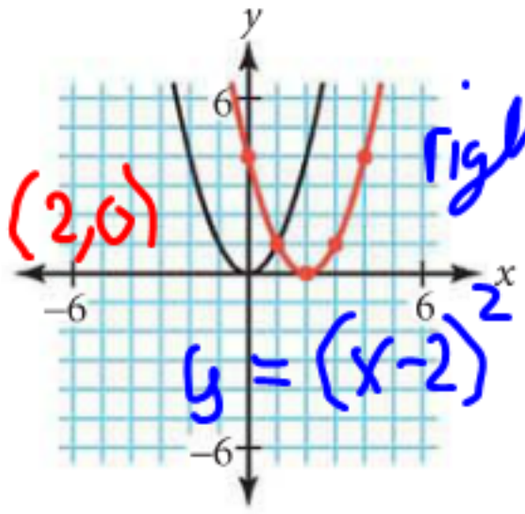
up 1

(0, 1)

$y-1 = x^2$

$y = x^2 + 1$

c.

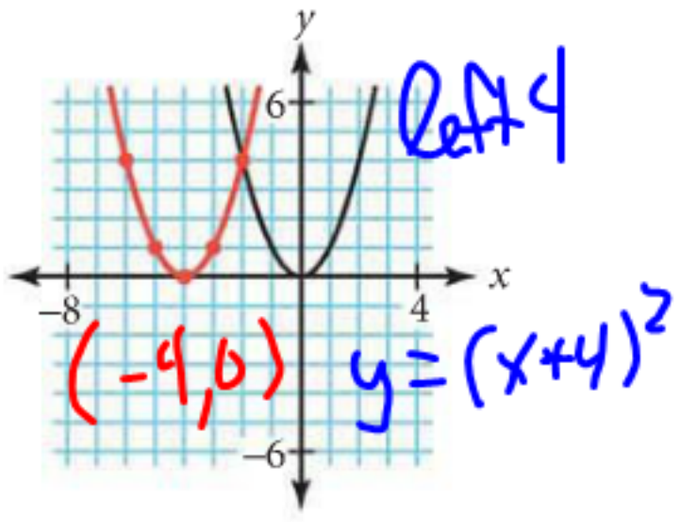


right 2

(2, 0)

$y = (x-2)^2$

d.

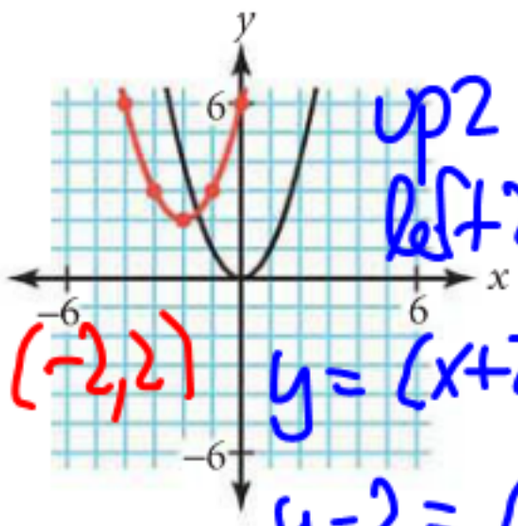


left 4

(−4, 0)

$y = (x+4)^2$

e.



up 2

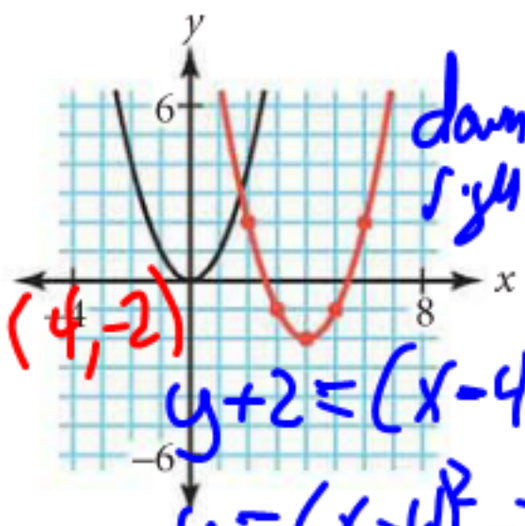
left 2

(−2, 2)

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

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

f.



down 2

right 4

(4, −2)

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

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

Step 2 | Write a few sentences describing any connections you discovered between the

Section 4.1 Quadratic Families

- Define families of Functions
- Describe the Quadratic family
- Translations of the Quadratic family

Family of Functions ⇒ look similar
- similar eqns
- characteristics of graph

Parent
- all others are transformations

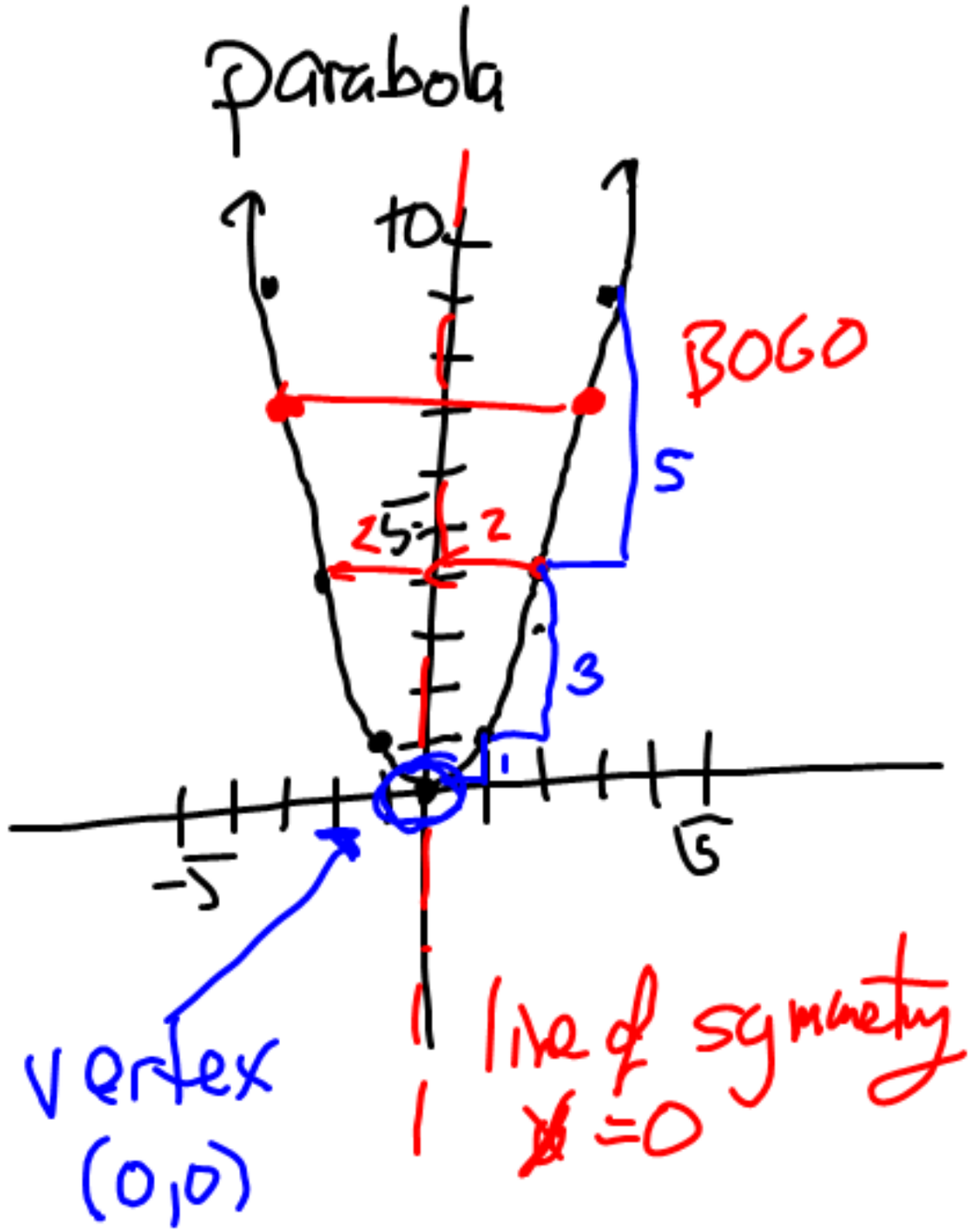
Linear Family ⇒ parent $y = x$

graph is straight (a line)
- slope ⇒ vert stretch dilation
- y-int ⇒ vert translation

Quadratic family

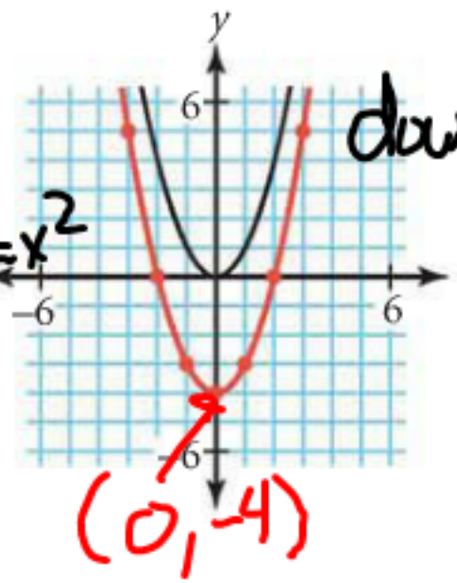
Parent $y = x^2$

x	y	
0	0	1
1	1	3
2	4	5
3	9	7
4	16	9
5	25	

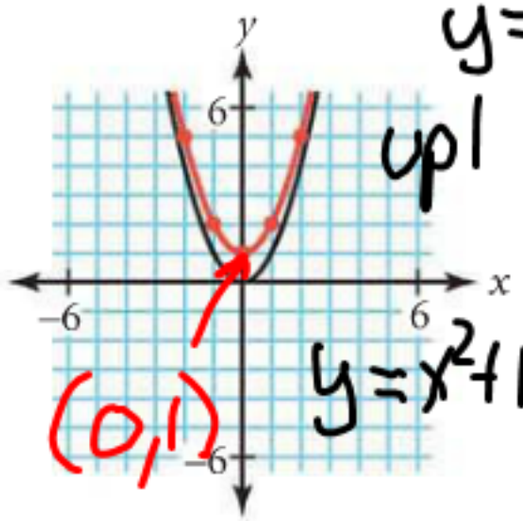


learned about translations of the graphs of functions in Lesson 4.3.

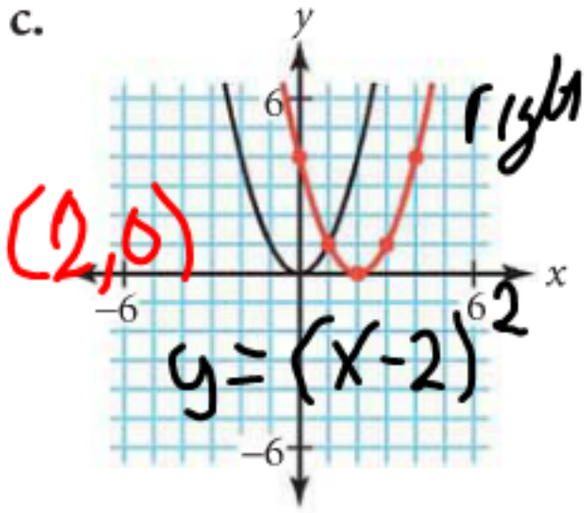
a.



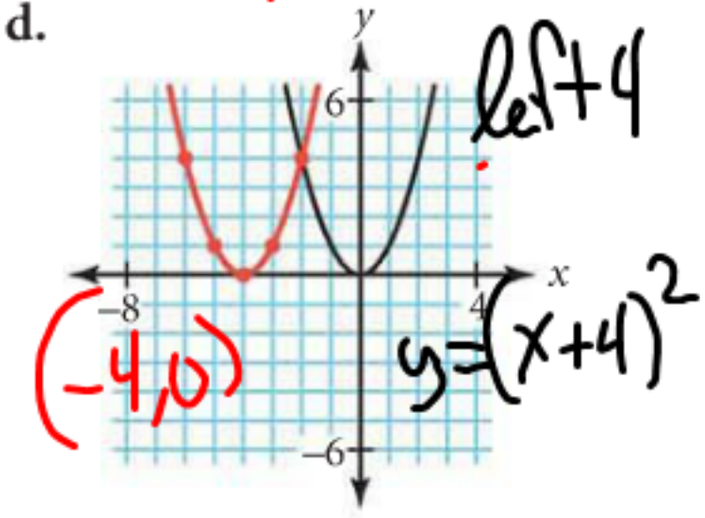
b.



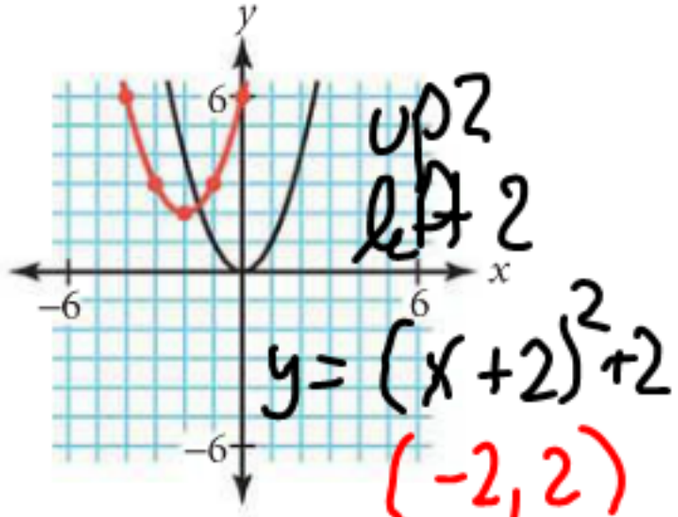
c.



d.



e.



f.