Finding the Vertex

Date:

Standards

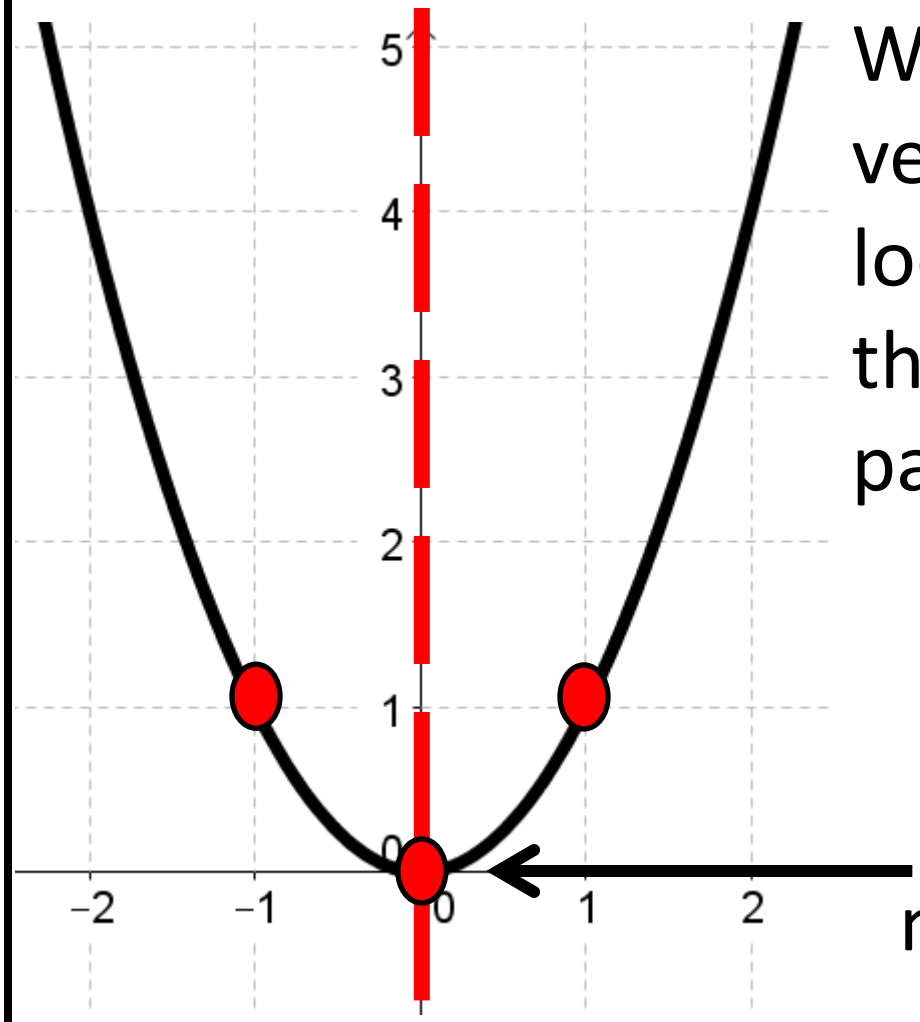
F.IF. 7a Graph quadratic functions

F.BF. 3 Identify effects on the graph by replacing f(x) with f(x) +k, kf(x), f(x+k)

Essential Questions

- Why do we want to find the vertex to graph?
- How do I find the vertex when a quadratic is written in Standard form?
- How do I find the vertex when a quadratic is written in vertex form?
- How do I graph using the vertex?

Why do we want to find the vertex to graph?



Where is the vertex located on the parabola?

In the middle!!

If we know the vertex, we can pick two points on either side to graph the parabola

How do I find the vertex when a quadratic is written in Standard form?

What is standard form?

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

Vertex

X value: $-\frac{b}{2a}$

Y value: Plug in x and solve for y

How do I find the vertex when a quadratic is written in Standard form?

What is standard form?

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

Standard Form	Breakdown
$y = x^2 + 2x + 3$	$a = 1, b = 2, c = 3$
$y = -x^2 + 3x - 4$	$a = -1, b = 3, c = -4$
$y = x^2 + 5$	$a = 1\ b = 0, c = 5$
$y = \frac{1}{4}x^2 + 2x + 1$	$a = \frac{1}{4}, b = 2, c = 1$
$y = -x^2 + 6x$	$a = -1, b = 6, c = 0$

How do I find the vertex when a quadratic is written in Vertex form?

What is Vertex form?

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

Vertex

(h, k)

How do I find the vertex when a quadratic is written in Vertex form?

What is vertex form?

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

Vertex Form	Breakdown
$y = 2(x - 2)^2 + 5$	$a = 2, h = 2, k = 5$
$y = (x + 1)^2 + 2$	$a = 1, h = -2, k = 2$
$y = -3(x + 7)^2 - 8$	$a = -3, h = 7, k = -8$
$y = (x - 5)^2 - 3$	$a = 1, h = 2, k = 3$
$y = -(x - 7)^2 + 10$	$a = 1, h = 2, k = 3$

How do I graph using the vertex?

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

a= 1

b= 2

c= 3

$$-\frac{b}{2a} = -\frac{2}{2 \cdot 1} = -\frac{2}{2} = -1$$

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

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

$$y = 1 - 2 + 3$$

$$y = 2$$

Vertex @ (-1, 2)

How do I graph using the vertex?

x	y
1	6
-1	2
-3	6

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

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

$$y = 1 + 2 + 3$$

$$y = 6$$

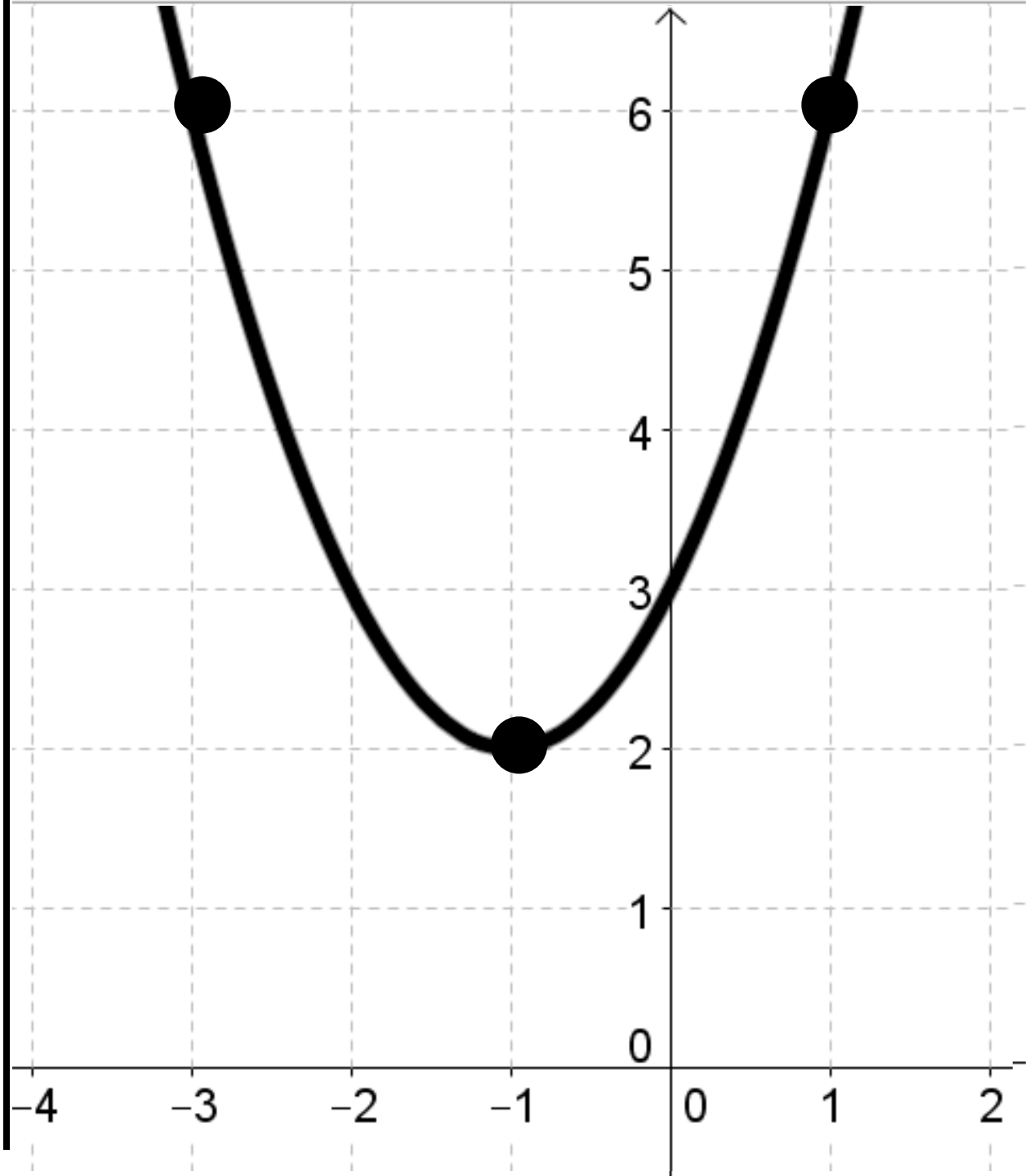
$$y = x^2 + 2x + 3$$

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

$$y = 9 - 6 + 3$$

$$y = 6$$

How do I graph using the vertex?



How do I graph using the vertex?

$$y = x^2 + 4$$

a= 1

b= 0

c= 4

$$-\frac{b}{2a} = -\frac{0}{2 \cdot 1} = -\frac{0}{2} = 0$$

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

$$y = (0)^2 + 2(0) + 3$$

$$y = 0 - 0 + 3$$

$$y = 3$$

Vertex @ (0, 3)

How do I graph using the vertex?

x	y
-2	8
0	3
2	8

$$y = x^2 + 4$$

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

$$y = 4 + 4$$

$$y = 8$$

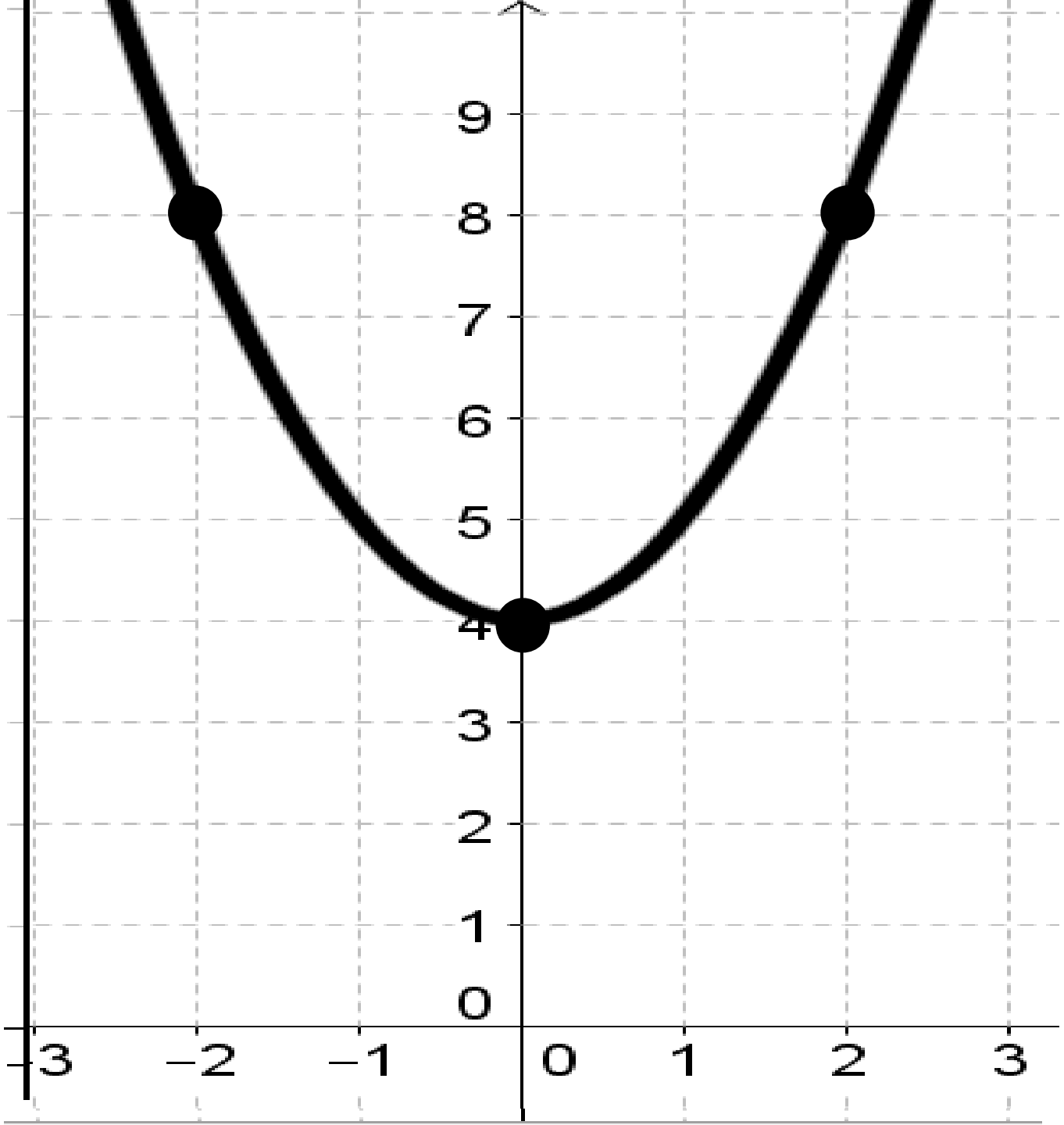
$$y = x^2 + 4$$

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

$$y = 4 + 4$$

$$y = 8$$

How do I graph using the vertex?



How do I graph using the vertex?

$$y = -3x^2 + 6x + 5$$

a= -3

b= 6

c= 5

$$-\frac{b}{2a} = -\frac{6}{2 \cdot -3} = -\frac{6}{-6} = 1$$

$$y = -3x^2 + 6x + 5$$

$$y = -3(1)^2 + 6(1) + 5$$

$$y = -3 \cdot 1 + 6 + 5$$

$$y = -3 + 6 + 5$$

$$y = 8$$

Vertex @ (1, 8)

How do I graph using the vertex?

x	y
-1	-4
1	14
3	-4

$$y = -3x^2 + 6x + 5$$

$$y = -3(-1)^2 + 6(-1) + 5$$

$$y = -3 \cdot 1 - 6 + 5$$

$$y = -3 - 6 + 5$$

$$y = -4$$

$$y = -3x^2 + 6x + 5$$

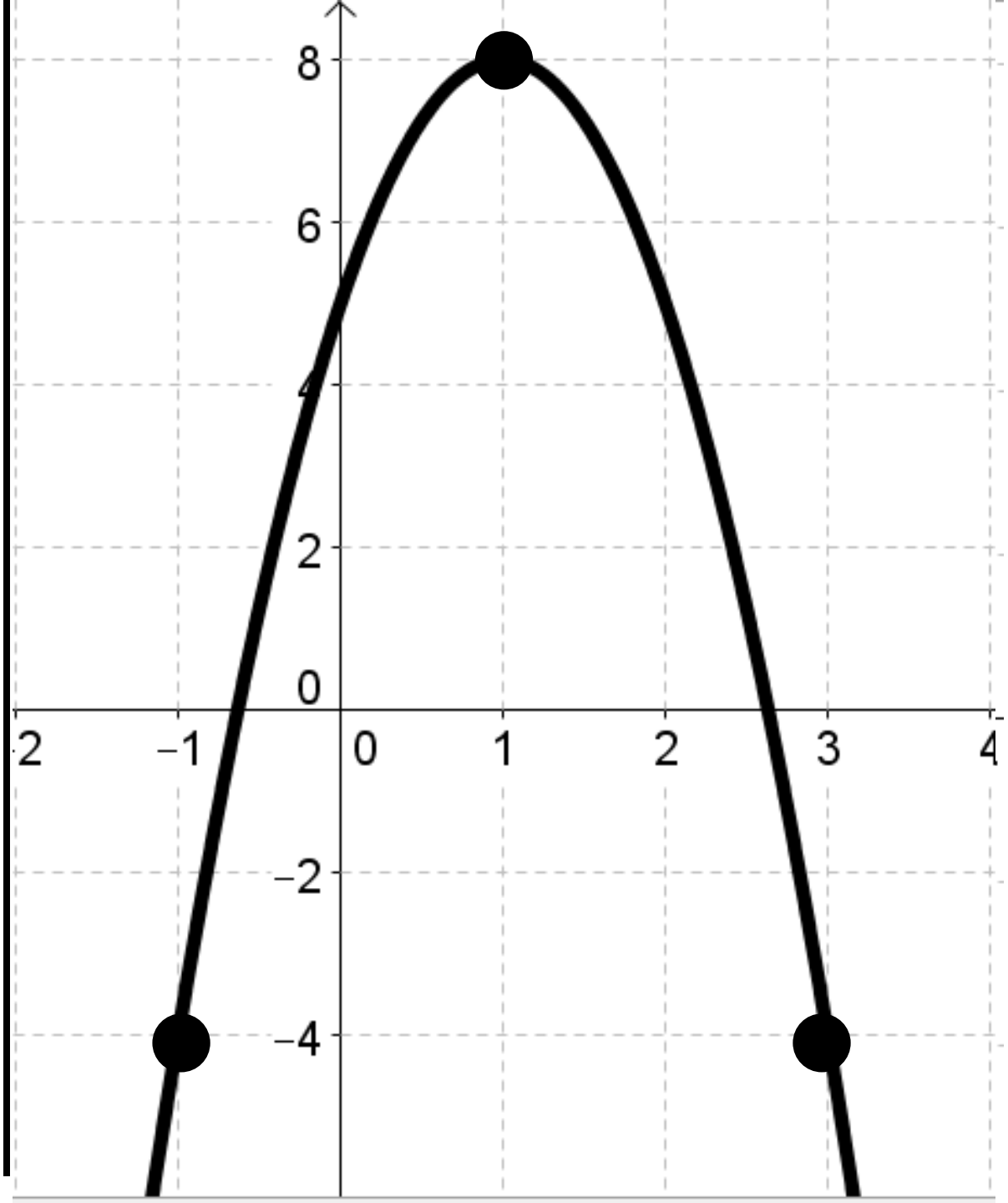
$$y = -3(3)^2 + 6(3) + 5$$

$$y = -3 \cdot 9 + 18 + 3$$

$$y = -27 + 18 + 3$$

$$y = -4$$

How do I graph using the vertex?



How do I graph using the vertex?

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

a= 1

h= -3

k= -4

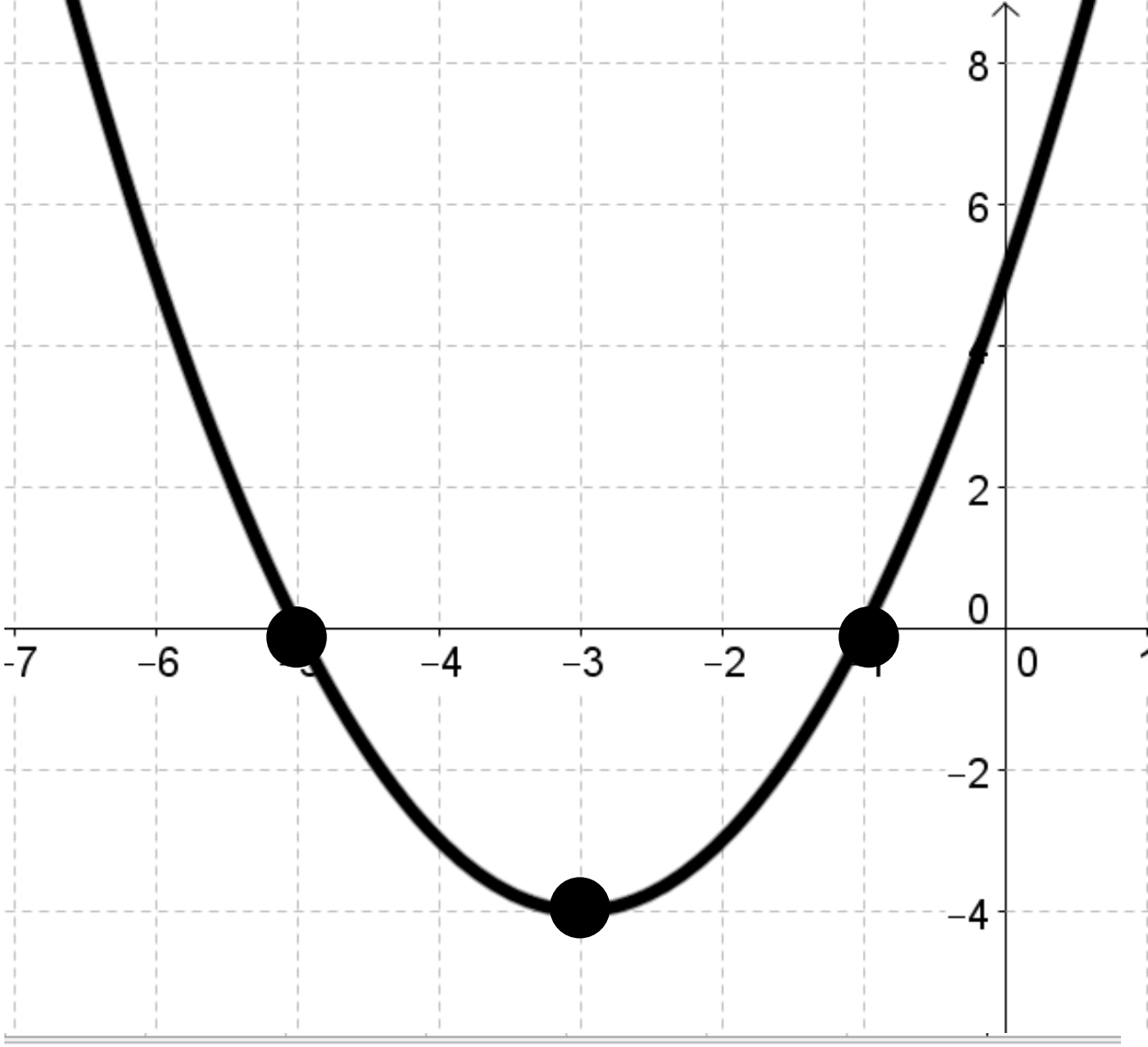
Vertex @ (-3 , 4)

x	y
-1	0
-3	4
-5	0

$$y = (x+3)^2 - 4$$
$$y = (-1+3)^2 - 4$$
$$y = (2)^2 - 4$$
$$y = 4 - 4$$
$$y = 0$$

$$y = (x+3)^2 - 4$$
$$y = (-5+3)^2 - 4$$
$$y = (2)^2 - 4$$
$$y = 4 - 4$$
$$y = 0$$

How do I graph using the vertex?



How do I graph using the vertex?

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

a= 2

h= 2

k= 5

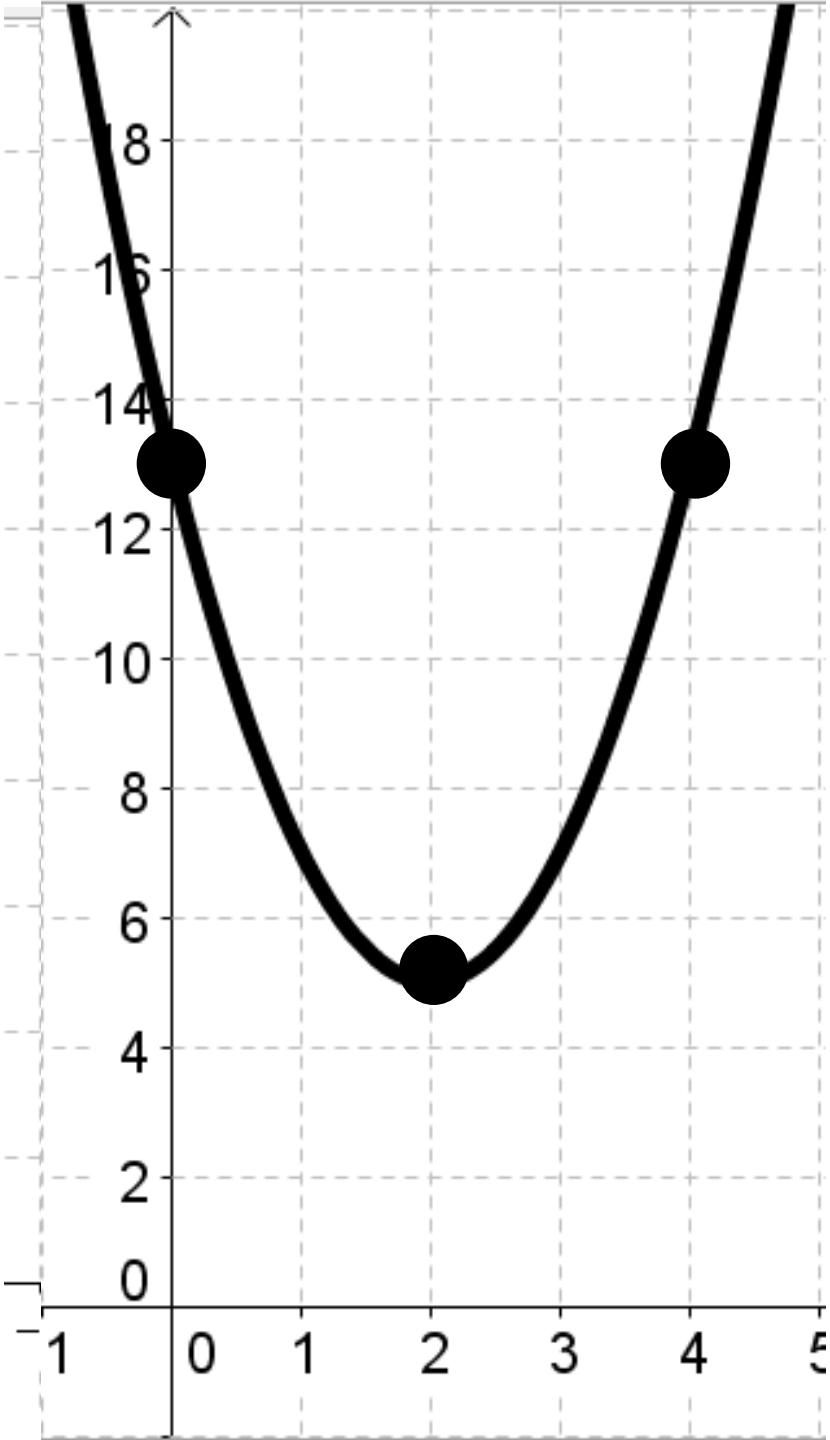
Vertex @ (2 , 5)

x	y
0	13
2	5
4	13

$$y = 2(x-2)^2 + 5$$
$$y = 2(0-2)^2 + 5$$
$$y = 2(-2)^2 + 5$$
$$y = 2 \cdot 4 + 5$$
$$y = 8 + 5$$
$$y = 13$$

$$y = 2(x-2)^2 + 5$$
$$y = 2(4-2)^2 + 5$$
$$y = 2(2)^2 + 5$$
$$y = 2 \cdot 4 + 5$$
$$y = 8 + 5$$
$$y = 13$$

How do I graph using the vertex?



How do I graph using the vertex?

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

a= -4

h= -2

k= 5

Vertex @ (-2 , 5)

x	y
-4	-11
-2	5
0	-11

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

$y = -4(-4 + 2)^2 + 5$

$y = -4(-2)^2 + 5$

$y = -4(4) + 5$

$y = -16 + 5$

$y = -11$

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

$y = -4(0 + 2)^2 + 5$

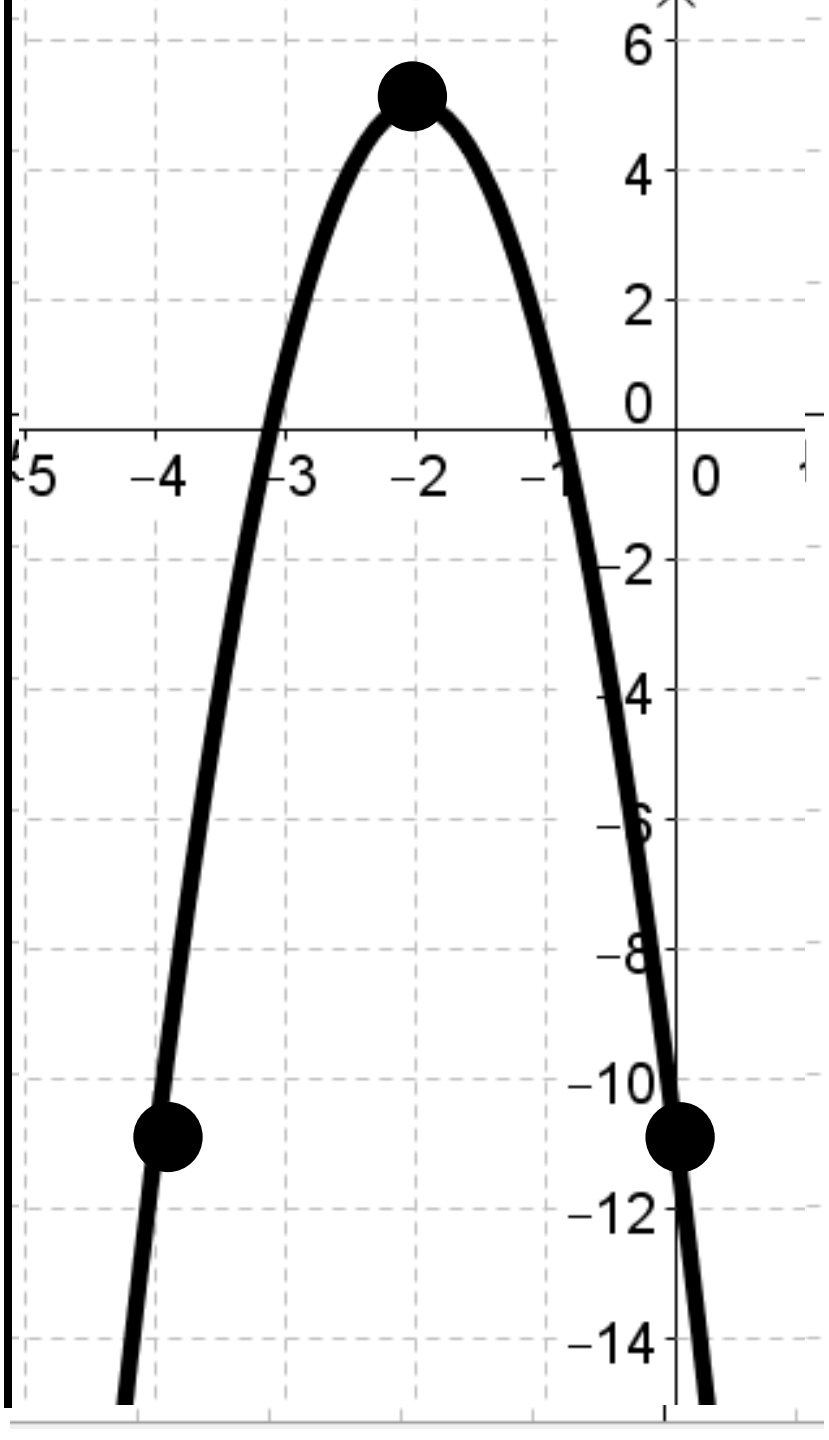
$y = -4(2)^2 + 5$

$y = -4(4) + 5$

$y = -16 + 5$

$y = -11$

How do I graph using the vertex?



REFLECTION:

1) Answer one of the essential questions
2) How have previous lessons helped or connect with this lesson?
3) What are you still confused on or what new info did you learn?

Homework: Finding the Vertex

1) $x^2 - 2x + 1$
   - Find the value of a, b, and c
   - Find the vertex of the parabola
   - Graph the parabola with the points before and after
2) $(x + 3)^2 - 4$
   - Find the value of a, h, and k
   - Find the vertex of the parabola
   - Graph the parabola with the points before and after