

Using your formula for the axis of symmetry, determine the vertex of the quadratic function

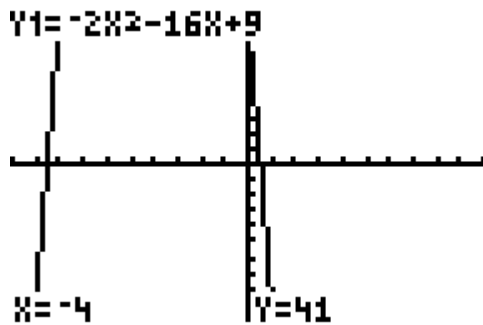
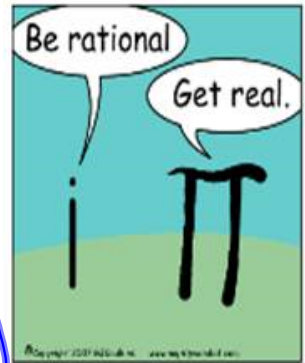


$a = -2 \quad b = -16 \quad c = 9$   
 $y = -2x^2 - 16x + 9$

AOS:  $x = \frac{-b}{2a} = \frac{-(-16)}{2(-2)} = -4$

$-2(-4)^2 - 16(-4) + 9 = 41$

$(-4, 41)$



X	Y <sub>1</sub>
-7	23
-6	33
-5	39
-4	41
-3	39
-2	33
-1	23

X = -7

## Converting the Equation Of A Parabola

Standard form of a parabola:  $y = ax^2 + bx + c$

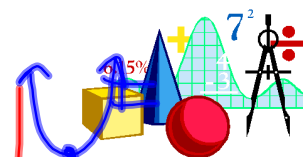
- if  $a > 0$ , the parabola opens up
- if  $a < 0$ , the parabola opens down

Vertex form of a parabola:  $y = a(x - h)^2 + k$  ★

- where  $(h, k)$  is the vertex
  - if  $a > 0$ , the parabola opens up
  - if  $a < 0$ , the parabola opens down
- x value negated, y-value stays*

**EXAMPLE #1**Given:  $y = (x - 1)^2 + 2$ 

opens up



a. Find the vertex.

 $(1, 2)$ 

b. Write the equation in standard form.

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

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

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

## EXAMPLE #2

Given:  $y = |x^2 - 6x + 9$



a. What is the vertex?

Plot1	Plot2	Plot3	X	Y1
$\sqrt{Y1} = X^2 - 6X + 9$			0	9
$\sqrt{Y2} =$			3	0
$\sqrt{Y3} =$			6	9
$\sqrt{Y4} =$				
$\sqrt{Y5} =$			X=6	

(h, k)  
(3, 0)

b. Write the equation in vertex form.

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

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

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

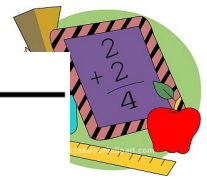
## EXAMPLE #3

Given:  $y = x^2 + 10x + 27$

a. What is the vertex?

$(-5, 2)$

X	Y <sub>1</sub>
-8	11
-7	6
-6	3
-5	2
-4	3
-3	6
-2	11



b. Write the equation in vertex form.

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

**EXAMPLE #4**

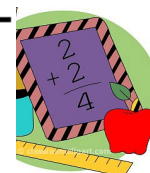
Given:  $y = -2x^2 + 8x - 3$

a. What is the vertex?

$(2, 5)$

X	Y <sub>1</sub>
-1	-13
0	-3
1	5
2	5
3	-3
4	-13

X=5



b. Write the equation in vertex form.

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

## More Practice:

### vertex form HW

Write each equation in vertex form.

1)  $y = x^2 + 6x - 5$

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

X	Y <sub>1</sub>
-6	-5
-5	-10
-4	-13
-3	-14
-2	-13
-1	-10
0	-5

$(-3, -14)$

$x = -6$

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

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

X	Y <sub>1</sub>
-5	11
-4	6
-3	2
-2	6
-1	11

$(-2, 2)$

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

$x = 1$

2)  $y = -2x^2 + 8x - 3$

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

$$y = 2x^2 - 12x + 17$$

X	Y <sub>1</sub>
0	17
1	7
2	1
3	1
4	7
5	17

$(3, -1)$

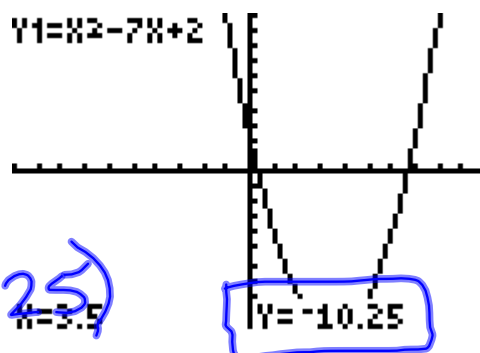
$x = 6$

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

X	Y1
0	2
1	-4
2	-8
3	-10
4	-10
5	-8
6	-4

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$$(3.5, -10.25)$$

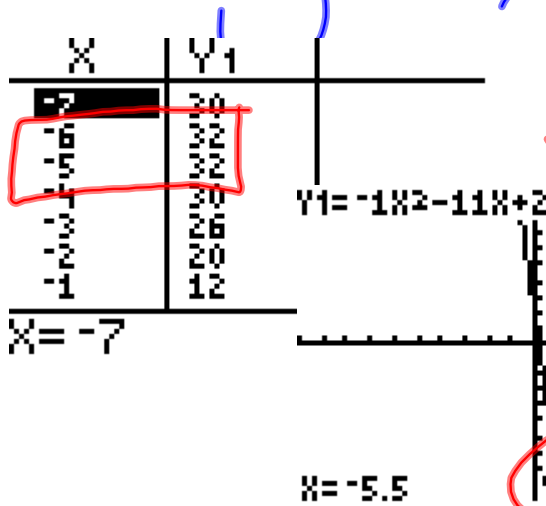


$$y = (x - 3.5)^2 - 10.25$$

$$y = \left(x - \frac{7}{2}\right)^2 - \frac{41}{4}$$



$$y = -1x^2 - 11x + 2$$



vertex:  $(-5.5, 32.25)$

$$y = -1(x + 5.5)^2 + 32.25$$

$$y = -\left(x + \frac{11}{2}\right)^2 + \frac{129}{4}$$