

## Factored Form: Part II

### Determining the Vertex from Factored Form

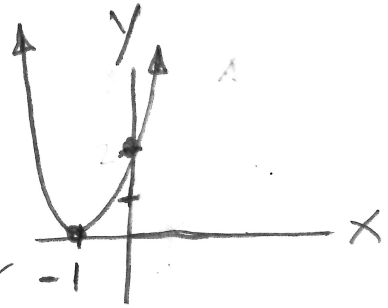
#### Review:

Standard Form  $\rightarrow y = ax^2 + bx + c$

The y-intercept is 'c'.

Factored Form  $\rightarrow y = a(x - r)(x - s)$

The x-intercept(s) are 'r' and 's'.



#### Practice:

For each quadratic equation, determine the x-intercept(s) and y-intercept.

a)  $y = x^2 + 3x - 10$

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

x-ints: 2, -5

y-int: -10

b)  $y = 2x^2 + 4x + 2$

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

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

x-int: -1

y-int: 2

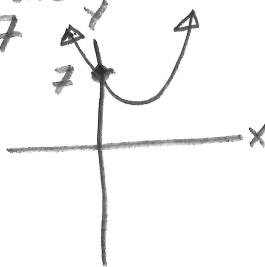
c)  $y = x^2 - 5x + 7$

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

Not factorable

x-int: none

y-int: 7



#### Determining the Vertex from Factored Form

The vertex is a point on the parabola that has an x-coordinate and a y-coordinate.

1. Determine the x-coordinate by averaging the x-intercepts.

$$x = \frac{x_{int1} + x_{int2}}{2}$$

2. Determine the y-coordinate by substituting the x-coordinate of the vertex into the original equation.

#### Example

Determine the y-intercept, x-intercept(s), and the vertex of the parabola defined by  $y = x^2 - 4x + 3$ .

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

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

x-ints: 1 & 3

y-int: 3

vertex

$x = \frac{(1) + (3)}{2}$

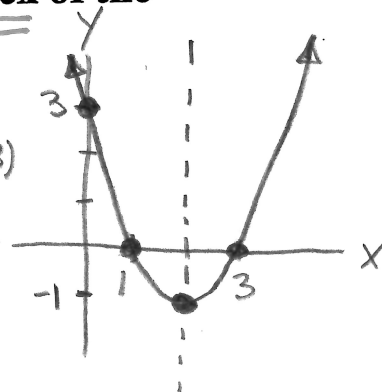
$x = \frac{4}{2}$

$x = 2$

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

$y = -1$

Vertex is (2, -1)



## Homework

For each quadratic relationship, determine the y-intercept, the x-intercept(s), and the vertex. Use this information to graph the parabolas.

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

$$y = (x-1)(x-5)$$

x-ints: 1 and 5

y-int: 5

vertex

$$x = \frac{(1)+(5)}{2}$$

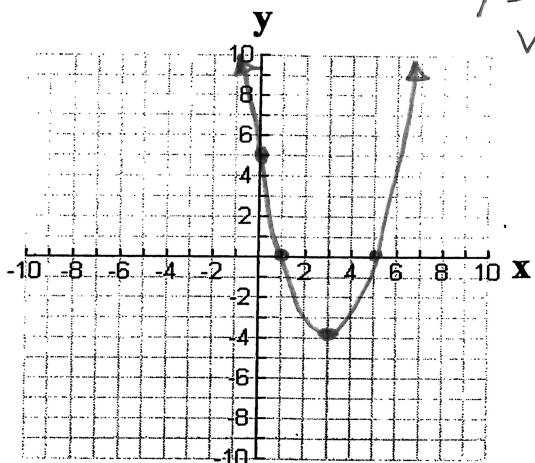
$$x = 3$$

$$y = (3-1)(3-5)$$

$$= (2)(-2)$$

$$y = -4$$

Vertex is (3, -4)



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

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

x-ints: -4 and 2

y-int: -8

vertex

$$x = \frac{(-4)+(2)}{2}$$

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

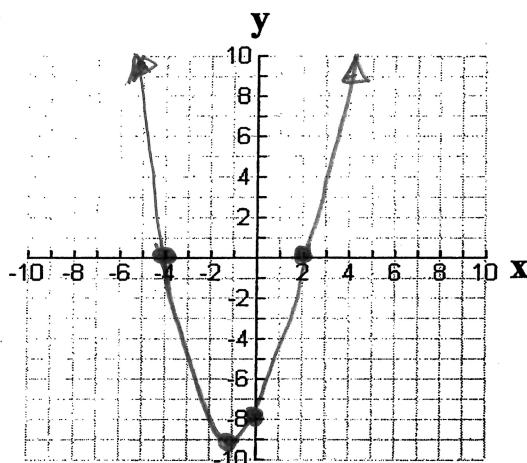
$$x = -1$$

$$y = (-1+4)(-1-2)$$

$$= (3)(-3)$$

$$y = -9$$

∴ The vertex is (-1, -9)



c)  $y = -2x^2 - 12x - 10$

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

$$y = -2(x+1)(x+5)$$

x-ints: -5 and -1

y-int: -10

vertex

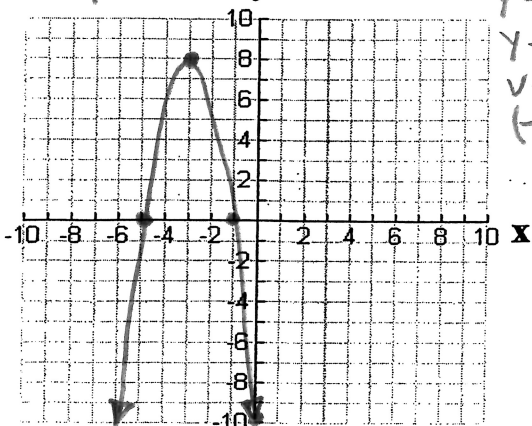
$$x = \frac{(-5)+(-1)}{2}$$

$$x = -3$$

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

$$y = -2(-2)(2)$$

y = 8  
vertex is (-3, 8)



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

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

x-int: 3

y-int: 9

vertex

$$x = \frac{(3)+(3)}{2}$$

$$x = 3$$

$$y = (3-3)(3-3)$$

y = 0  
∴ The vertex is (3, 0)

