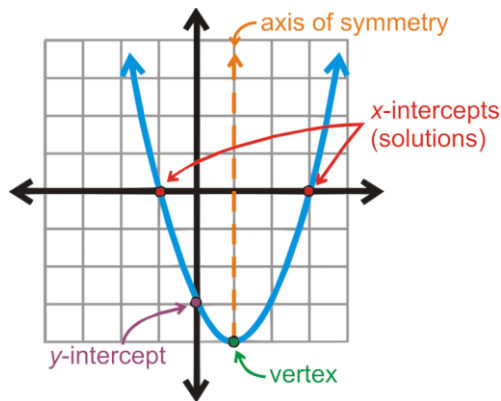


The graph of a Quadratic Function is called The Parabola.

We will continue from the notes from last week:

### Parts of the Parabola



### Finding the axis of Symmetry and the y-intercept

#### Example

- Determine the zero(s) for each of the following and use them to find the axis of symmetry and the y-intercept.

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

Set  $y=0$  since we are looking for the x-intercepts.

$$0 = -(x-2)(x-8)$$

$$0 = (x-2)(x-8) \text{ multiplied both sides by } -1$$

$$\text{Either } x-2 = 0 \text{ or } x-8 = 0$$

$$x = 2 \text{ or } x = 8$$

From last week, we know the zeros are 2 and 8.

Once again to find the vertex,

$$h = (2+8)/2 \quad \leftarrow \text{find the midpoint of the zeros (x-value)}$$

$$h = 5$$

$$k = -(5-2)(5-8) \quad \leftarrow \text{find the optimal value (y-value)}$$

$$= 9$$

Therefore the vertex is (5,9).

The axis of symmetry is given by  $x=h$ ,

In this problem the  $h$  is equal to 5, so the axis of symmetry is  $x = 5$ .

To Find the y-intercept, let all x's equal to zero and calculate for y

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

$$y = -(0-2)(0-8)$$

This results in the following:

$$y = -(-2)(-8)$$

$$y = -16 \quad \text{This is the y-intercept, where the graph crosses the y-axis}$$

So now we know how to find our x-intercepts, vertex, axis of symmetry, and our y-intercept. By plotting these points, we can graph a very precise parabola!

### Graphing a more precise parabola:

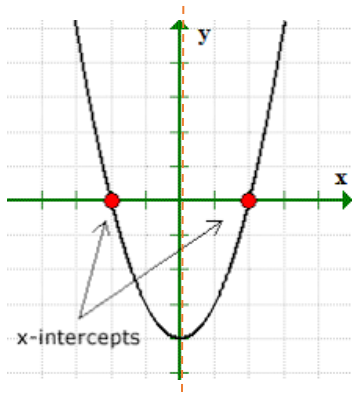
**First** find the x-intercepts. Once again, these are the zeroes of the factors.

Example:  $y = x^2 - 4$

$$x^2 - 4 = 0$$

$$(x + 2)(x - 2) = 0$$

$$x = -2 \text{ and } x = 2 \quad \text{These are the 2 x-intercepts}$$



**Second** find the vertex, what we did above.

$$h = \frac{2 + (-2)}{2} = 0 \quad y = x^2 - 4$$

$$k = y = 0^2 - 4 = -4$$

so the vertex is  $(0, -4)$

**Step 3** Knowing our vertex, now we know our axis of symmetry, which in this case is  $x = 0$ , represented with the dashed red line.

**Step 4** To find the y-intercept, you can use either the original equation or the factored form, and let all x's equal to zero:

$$y = x^2 - 4 \quad \text{Or} \quad (x + 2)(x - 2) = y$$

$$y = 0^2 - 4 \quad (0 + 2)(0 - 2) = y$$

$$y = -4 \quad y = -4$$

By plotting these points, we get a much more precise parabola.

**Parts of a Parabola:**

1. Describe what the axis of symmetry is?
2. The axis of symmetry is the same as what component of the vertex?
3. How do you find the y-intercept of a parabolic function?

**Determine the axis of symmetry and the y-intercept for each.**

1.  $y = (x + 4)(x + 12)$

2.  $y = 8(x - 5)(x + 9)$

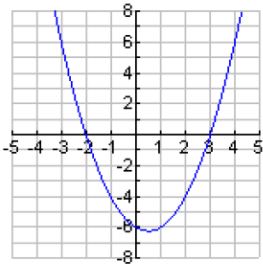
3.  $y = (x - 7)(x - 1)$

4.  $y = -0.5(x - 1)(x + 7)$

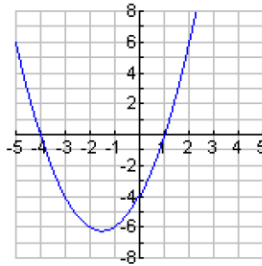
**Connecting Graphs with their y-intercepts:**

**Match each equation to its graph.**

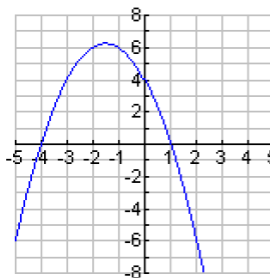
**Graph A**



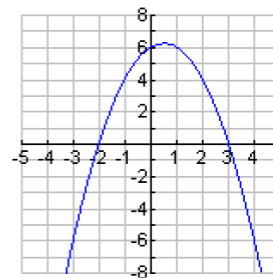
**Graph B**



**Graph C**



**Graph D**



1) y-intercept of 4

2) y-intercept of -6

3) y-intercept of 6

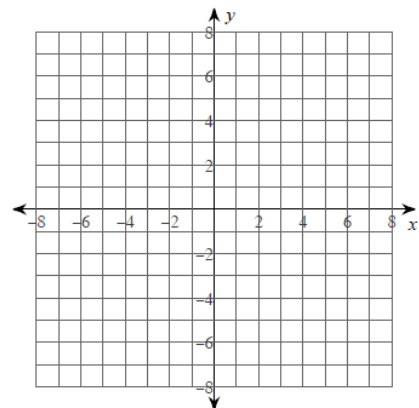
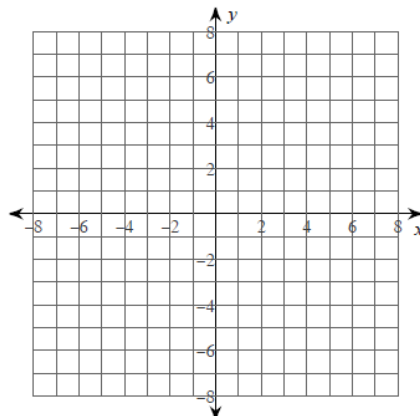
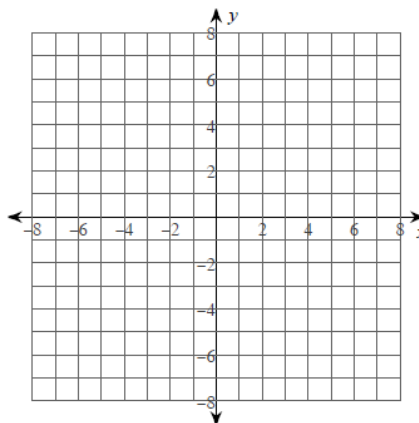
4) y-intercept of -4

**Graph the following parabolas. Make sure that you draw the axis of symmetry and calculate and plot the y-intercept. (please do the calculations on a separate sheet of paper)**

1.  $f(x) = (x + 2)(x - 4)$

2.  $f(x) = -(x + 1)(x + 3)$

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

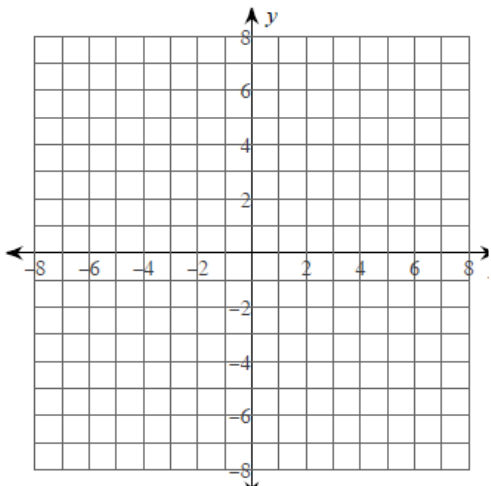
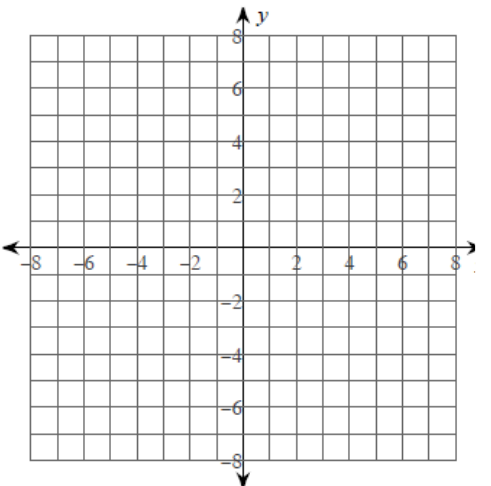


Summary Assignment Week 4

Determine the axis of symmetry and the y-intercept for each parabola.

1. $y = (x+1)(x+3)$	2. $y = (x+3)(x-5)$
3. $y = (x-4)^2$	4. $y = -(x-4)(x+2)$

Sketch a precise graph for each parabola. Please show all the important features on your sketched graph.

5. $y = (x+1)(x+5)$ 	6. $y = -(x+1)(x-1)$ 
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