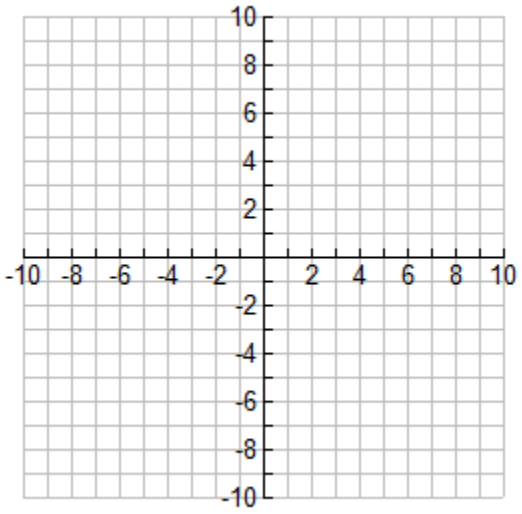
Name: _____ **Date:** _____ **Period:** _____

Secondary II Graphing Quadratic Functions

Graphing from Standard Form

1. Graph the function $f(x) = x^2$ by completing the table of values and plotting the points.

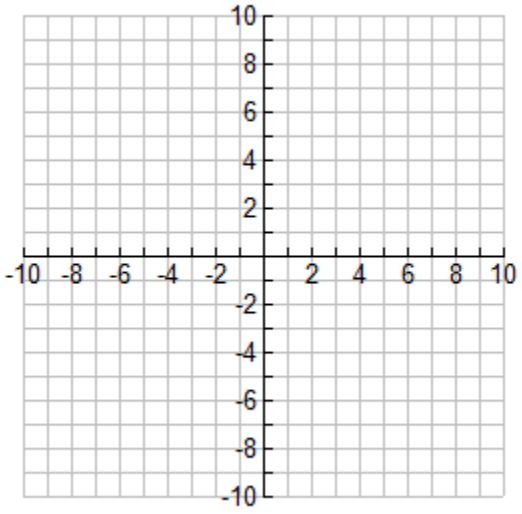
x	*f(x)*
-3	
-2	
-1	
0	
1	
2	
3	



a. What is the vertex of $f(x) = x^2$?
b. What is the axis of symmetry of $f(x) = x^2$?

2. Graph the function $f(x) = -x^2$ by completing the table of values and plotting the points.

x	*f(x)*
-3	
-2	
-1	
0	
1	
2	

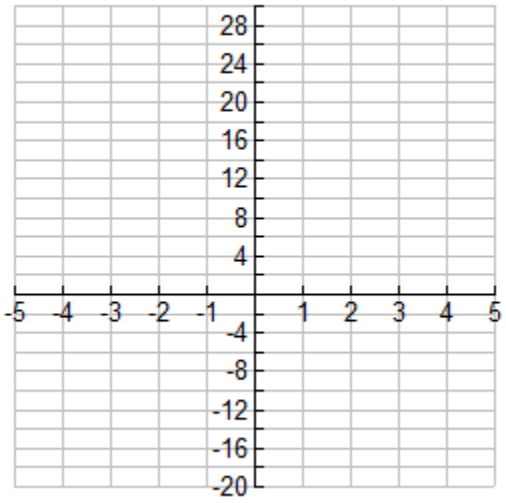


a. What is the vertex of $f(x) = -x^2$?
b. What is the axis of symmetry of $f(x) = -x^2$?

c. Describe the effect of *a* on the graph of $f(x) = ax^2$ using the graphs you created in questions 1 and 2.

3. Graph the function $f(x) = 2x^2 - 8x + 6$ by completing the table of values and plotting the points.

x	*f(x)*
-2	
-1	
0	
1	
2	
3	
4	



a. What is the vertex of $f(x) = 2x^2 - 8x + 6$?

b. What is the axis of symmetry of $f(x) = 2x^2 - 8x + 6$?

The quadratic functions we have graphed in the previous problems have been in **standard form**:

$f(x) = ax^2 + bx + c$

For a quadratic function in standard form, the *x*-coordinate of the vertex is $-\frac{b}{2a}$.

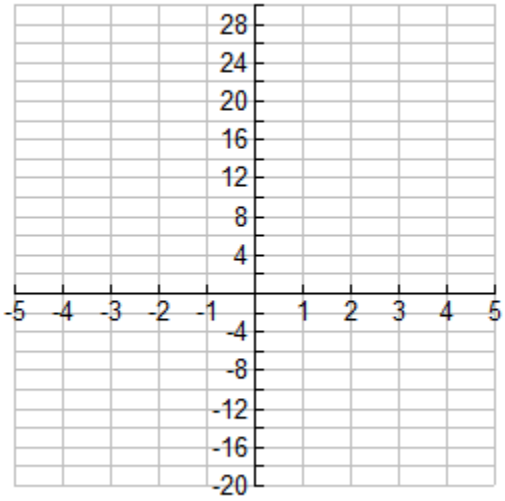
The axis of symmetry is $x = -\frac{b}{2a}$.

4. We can use the symmetry of the graph of a quadratic function to help us graph more efficiently. Let's try graphing the function $f(x) = 2x^2 - 8x + 6$ from the previous problem a different way.

Step 1: Find the vertex of the graph.

Find the *x* coordinate of the vertex for the function by finding $-\frac{b}{2a}$.

$f(x) = 2x^2 - 8x + 6.$



To find the *y*-coordinate of the vertex, plug the value of the *x*-coordinate of the vertex into the function.

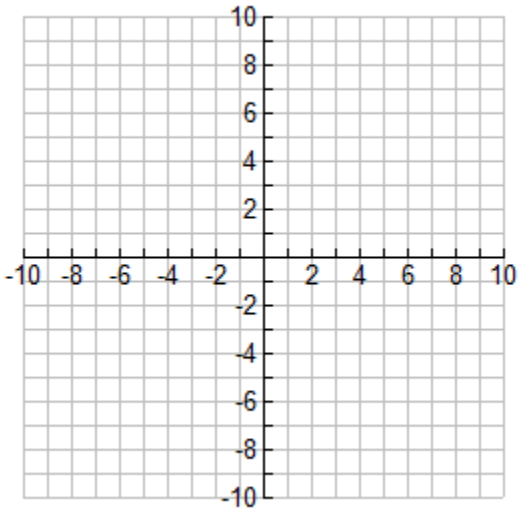
Step 2: Plot the vertex.

Step 3: Draw a dashed vertical line through the vertex. This represents your axis of symmetry.

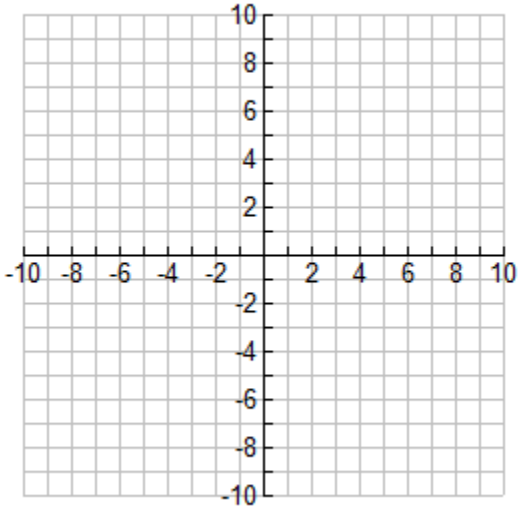
Step 4: Find and plot two or three points on one side of the axis of symmetry.

Step 5: Use symmetry to plot the corresponding points on the other side of the axis of symmetry.

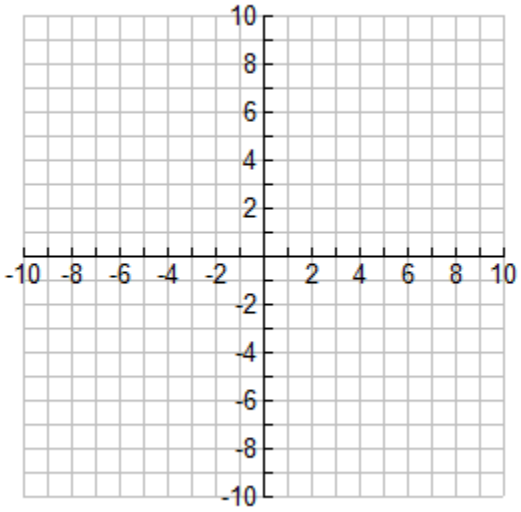
Graph the following quadratic functions using the method from question 4. Once graphed, identify the key features of the graph.



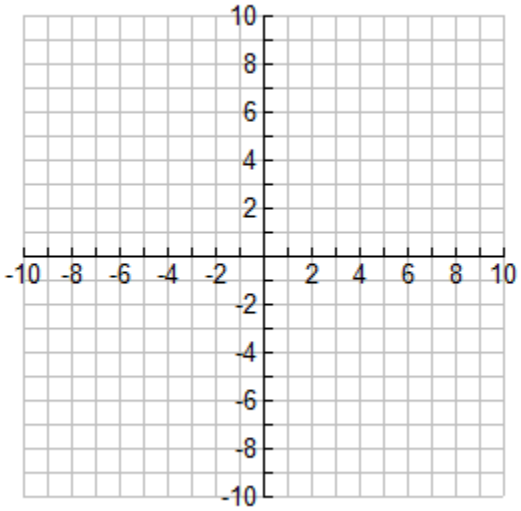
5. $f(x) = x^2 - 2x - 1$



6. $f(x) = -x^2 + 4x - 2$



7. $f(x) = 2x^2 - 4x - 2$



8. $f(x) = -3x^2 + 5$

Graphing from Vertex Form

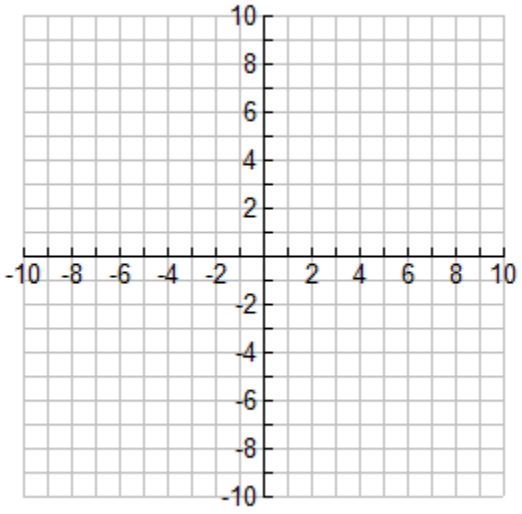
Another form of a quadratic function is **vertex form**:

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

Vertex form can be very useful because as its name suggests, the vertex can be easily identified. The vertex of a quadratic function in vertex form is (h, k). The axis of symmetry is $x = h$.

9. To graph the function $f(x) = (x - 1)^2 + 2$ which is in vertex form, do the following:

Step 1: Find the vertex of the graph.



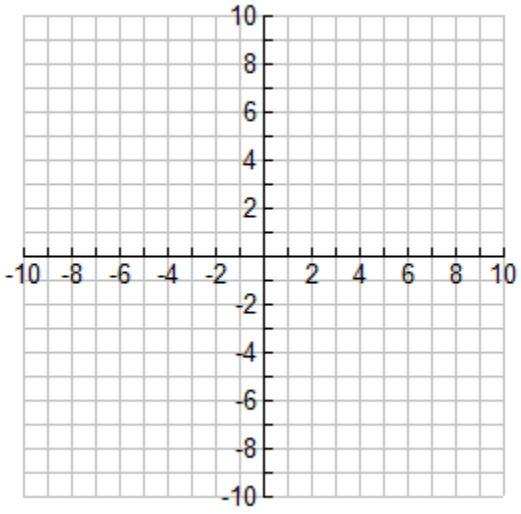
Step 2: Plot the vertex.

Step 3: Draw a dashed vertical line through the vertex. This represents your axis of symmetry.

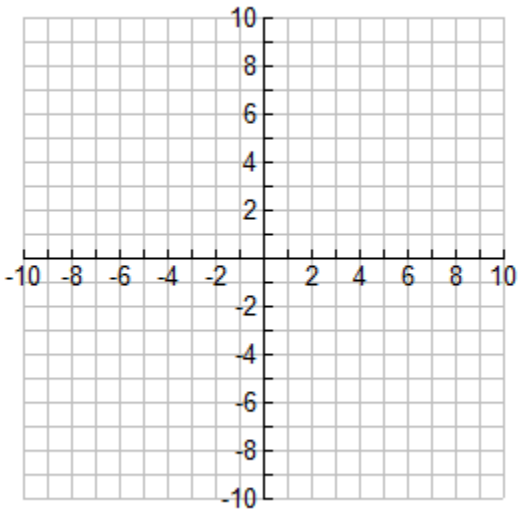
Step 4: Find and plot two or three points on one side of the axis of symmetry.

Step 5: Use symmetry to plot the corresponding points on the other side of the axis of symmetry.

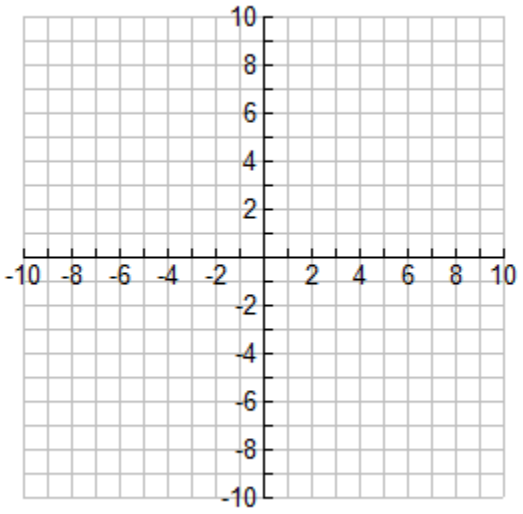
Graph the following quadratic functions which are in vertex form using the method from question 9. Once graphed, identify the key features of the graph.



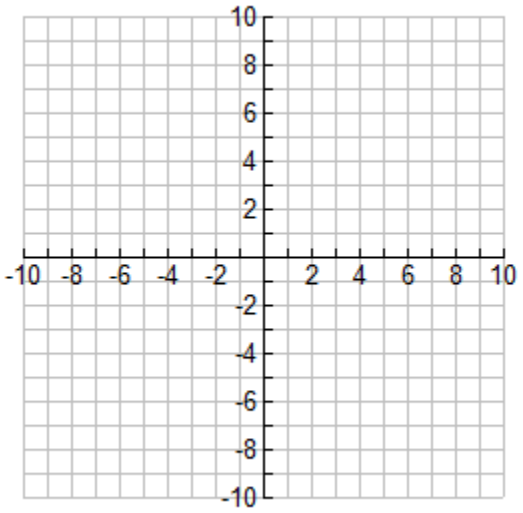
10. $f(x) = -3(x-2)^2 + 4$



11. $f(x) = (x+2)^2 - 1$



12. $f(x) = -(x-2)^2 - 1$



13. $f(x) = -\frac{1}{4}(x-1)^2 + 4$

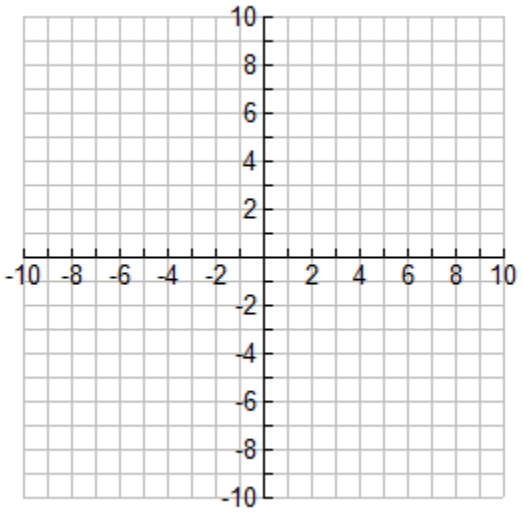
Graphing from Intercept Form

Another form of a quadratic function is **intercept form** or **factored form**:

$f(x) = a(x - p)(x - q)$ Intercept form can be very useful because as its name suggests, the *x*-intercepts can be easily identified. The *x*-intercepts are *p* and *q*. The axis of symmetry is midway between (*p*, 0) and (*q*, 0).

14. To graph the function $f(x) = (x - 2)(x - 4)$ which is in intercept form, do the following:

Step 1: Identify the *x*-intercepts.



Step 2: Plot the *x*-intercepts.

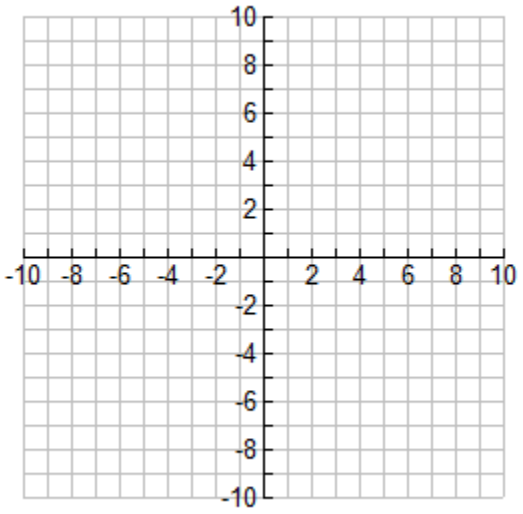
Step 3: The axis of symmetry is midway between the x-intercepts. Determine the axis of symmetry and draw a dashed vertical line. This also tells you the *x*-coordinate of your vertex.

Step 4: To find the *y*-coordinate of the vertex, plug the value of the *x*-coordinate of the vertex into the function.

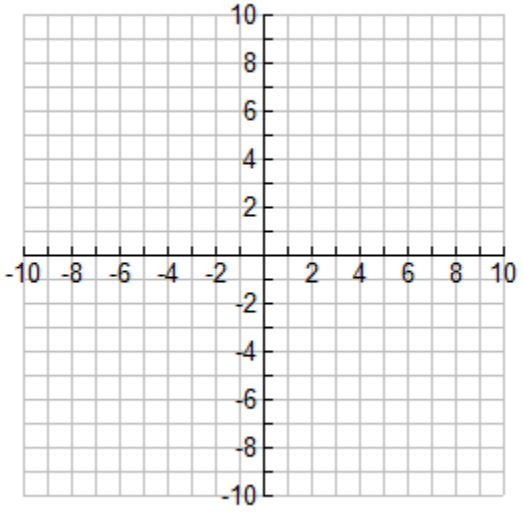
Step 5: Plot the vertex.

Step 6: To see more of the graph, determine one or two more points on one side of the axis of symmetry, plot these, and then plot the corresponding points.

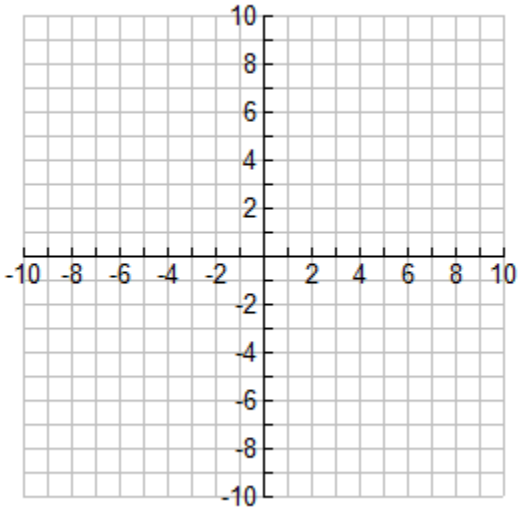
Graph the following quadratic functions which are in intercept form using the method from question 14. Once graphed, identify the key features of the graph.



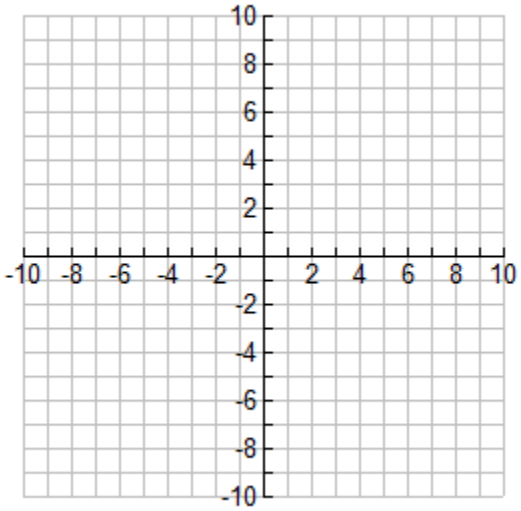
15. $f(x) = (x + 2)(x - 4)$



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



17. $f(x) = -\frac{1}{4}(x+1)(x+5)$



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