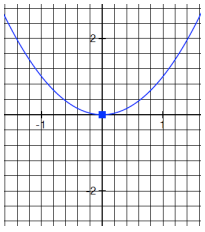
8-1 Vertex Form

A quadratic equation, when graphed forms a parabola. Every parabola has a vertex and an axis of symmetry.



Identify the vertex and axis of symmetry:

Make a hypothesis of where the axis of symmetry will always be:

I can see the vertex of a quadratic when the quadratic is in graphing, or vertex form: $f(x)=a(x-h)^2+k$

The vertex is the point _____

Remember X'S ALWAYS _____

The axis of symmetry will always be the line _____.

A quadratic equation has two most common forms:

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

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

We call this vertex form because you can see the _____ which is _____. REMEMBER THAT X's ALWAYS _____

To change a quadratic from standard form to vertex form we must complete the square. This then allows us to see the vertex.

Change the following quadratic into vertex form and identify the vertex and axis of symmetry

$f(x)=x^2+6x-1$

Change the following into vertex form and identify the vertex and axis of symmetry:

$$f(x) = x^2 + 4x + 3$$

Change the following into vertex form and identify the vertex and axis of symmetry:

$$f(x) = 7x^2 - 14x - 56$$

Change the following into vertex form and identify the vertex and axis of symmetry:

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

Change the following into vertex form and identify the vertex and axis of symmetry:

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

Change the following into vertex form and identify the vertex and axis of symmetry:

$$f(x) = 6x^2 + 24x - 18$$

dbramall

8-2: Transformations with Quadratic Functions

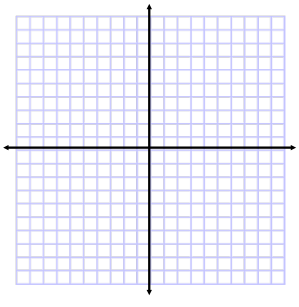
1. Quadratic transformation activity.
2. Vertex Form: $f(x) = a(x-h)^2 + k$
3. Vertex:
4. Axis of symmetry:
5. Parent Graph: $f(x) = x^2$

Use what you discovered during the activity to complete each of the following.

6. Compare $f(x) = x^2$ and $g(x) = 2(x - 3)^2 + 2$.

List all the transformations from f(x) to g(x).

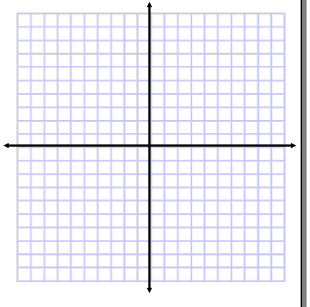
Graph each.



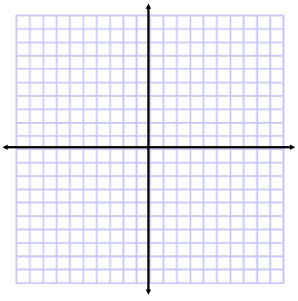
7. Compare $f(x) = x^2$ and $g(x) = -3(x+ 4)^2 - 3$.

List all the transformations from f(x) to g(x).

Graph each.



8. Compare $f(x) = x^2$ and $g(x) = -1/2(x+1)^2 - 3$
List all the transformations from f(x) to g(x).
Graph each.



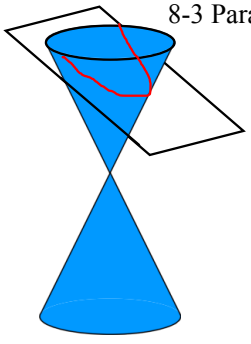
9. The graph of the parent graph $f(x) = x^2$ has been transformed by the following:

Horizontally expanded by a factor of 1/4.

Vertically translated up 7.

Horizontally translated right 4.

Write the new equation for this graph.

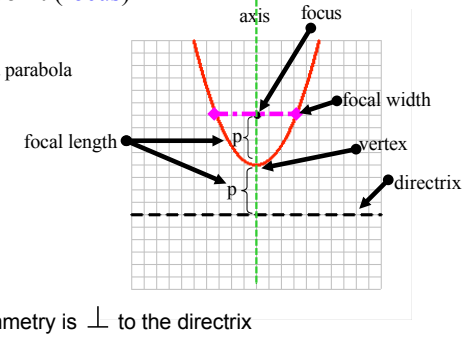


8-3 Parabolas - In Depth

parabola as a conic section

Parabola : set of all points in a plane equidistant from a particular line (directrix) and a particular point (focus)

the parts of a parabola



axis of symmetry is $\perp$ to the directrix

Focal width - the segment thru the focus perpendicular to the axis of symmetry. Its endpoints lie on the parabola and has length = $|4p|$ (parallel to the directrix)

Axis of Symmetry - line $\perp$ to the focal width & directrix. It intersects the parabola at the vertex.

measure from the focus to an endpt of the focal width = measure from the focus to the directrix.

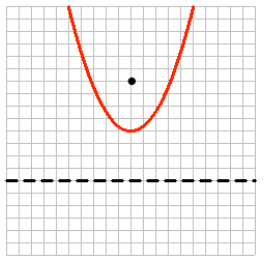
Parabola - standard form

up/down

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

$p = \frac{1}{4a}$ therefore, $a = \frac{1}{4p}$

vertex	(h, k)
focus	(h, k + p)
directrix	y = k - p
axis	x = h
focal length	p
focal width	$\|4p\|$



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

vertex

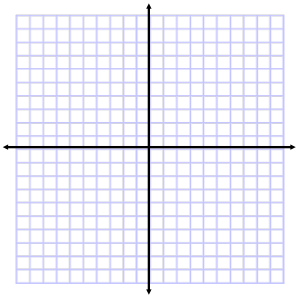
focus

directrix

axis

focal length

focal width



Graph: $y = \frac{1}{4}(x+2)^2 - 5$

vertex

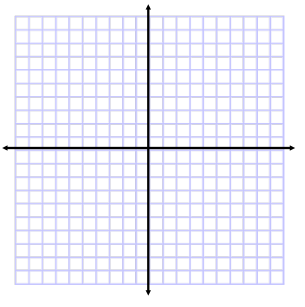
focus

directrix

axis

focal length

focal width



Example:

Write the equation for a parabola with Focus: $\left(4, 3\frac{1}{4}\right)$ and directrix: $y = 2\frac{3}{4}$

What information do you need to write the equation of a parabola?

What do we have? What do we need to find?

To find K: What do we know about the relationship between the point k and distance to the focus and the directrix?

k is the _____ between the focus and the directrix

To find a: Remember $p = \frac{1}{4a}$ what did we learn above that allows us to find p? How can we find a once we know p?

Now we know h, k, and a we can write the equation in vertex form:

Write the equation for a parabola with F: (4, -4) and directrix y = -6

Write the equation for a parabola with F: (-3, -2) and directrix y = 6

Name: _____ Date: _____ Period: _____

Secondary Math II

8-1 In-Class
Vertex Form

Identify the vertex and the axis of symmetry:

1. $f(x) = -2(x-3)^2 + 9$

2. $f(x) = 5(x+8)^2 - 12$

3. $f(x) = \frac{1}{2}(x-3)^2 - \frac{12}{15}$

4. $f(x) = -(x+\frac{1}{3})^2 + 7$

Solve by completing the square.

5. $f(x) = 5v^2 - 10v - 21$

6. $f(x) = 4x^2 + 16x - 65$

7. $f(x) = r^2 + 2r - 33$

8. $f(x) = m^2 - 12m + 26$

9. $f(x) = 3x^2 - 18x + 21$

10. $f(x) = x^2 + 2x - 63$

Name: _____ Date: _____ Period: _____

Secondary Math II

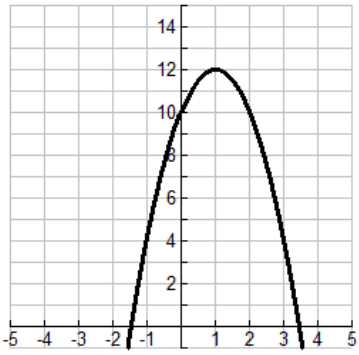
8-2 In-Class

Transformations

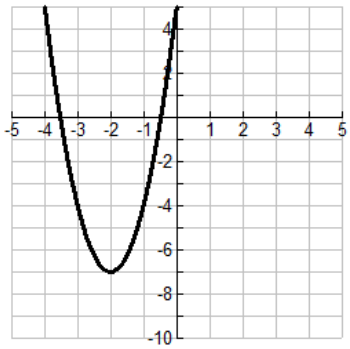
Match a graph to the function. Explain your choice.

_____1. $f(x)=3(x+2)^2-7$ _____2. $f(x)=12-2(x-1)^2$ _____3. $f(x)=12-2(x+1)^2$

a.



b.



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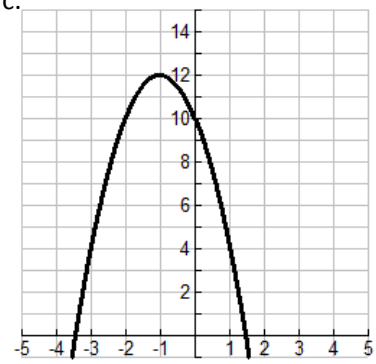
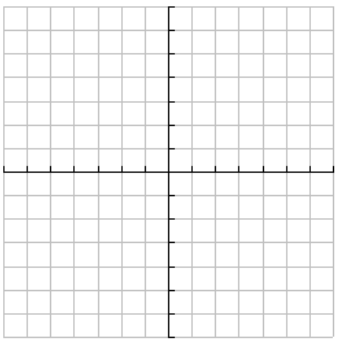


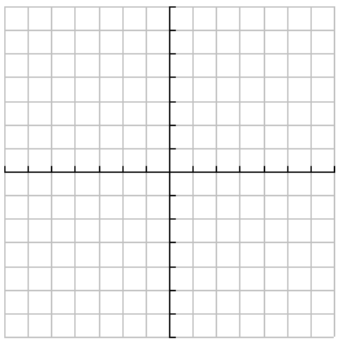
Write each quadratic function in vertex form. Describe the transformations. Give the coordinates of the vertex and the equation for the axis of symmetry.

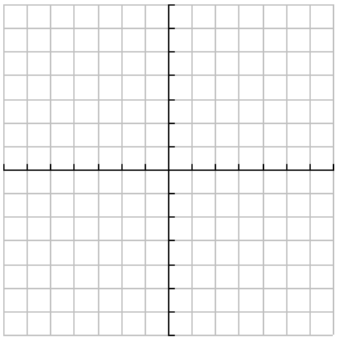
4. $g(x)=x^2-6x-2$ 6. $g(x)=x^2+7x+3$ 7. $g(x)=-2x^2+12x+1$

Describe how to transform the graph of $f(x)=x^2$ into the graph of the given function. Sketch each graph by hand.

7. $g(x)=3x^2$ 8. $g(x)=5(x-1)^2-7$ 9. $g(x)=-3x^2+6x-9$







Name: _____ Date: _____ Period: _____

Secondary Math II

8-3 In-Class
Focus and Directrix

Identify the focus, directrix, and focal length of the following parabolas

1. $f(x)=3(x+2)^2-7$

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

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

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

Write the equation for the following parabolas give the focus and the directrix.

5. Focus: (3, 5) Directrix: y =1

6. Focus: $\left(2,\frac{1}{4}\right)$ Directrix: $y=-\frac{1}{4}$

7. Focus: (3, 8) Directrix: y =4

8. Focus: (0,0) Directrix: y = 1

9. Focus: (2, 5) Directrix: y =3

10. Focus: $\left(4,\frac{5}{2}\right)$ Directrix: $y=\frac{3}{2}$