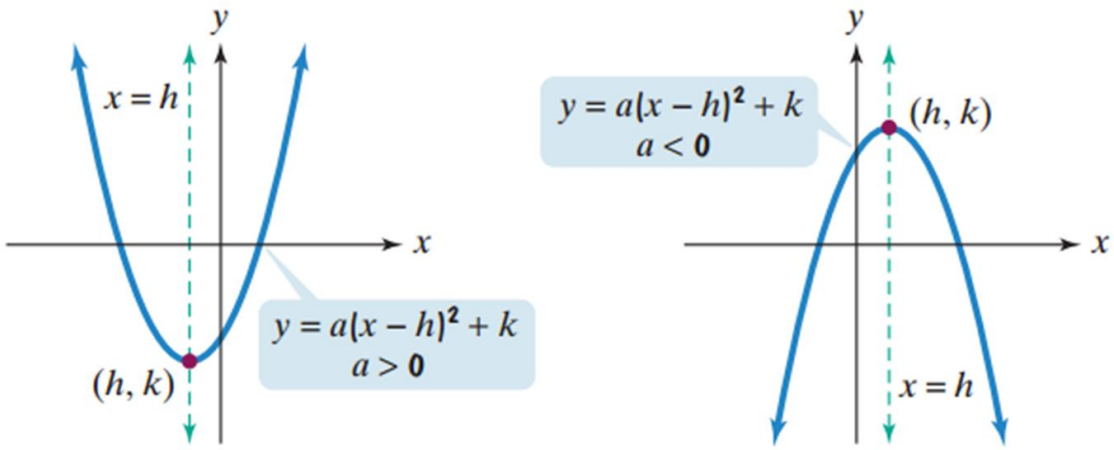
PreCalculus **Name**_____
9.1 Parabolas **Date**_____**Block**_____

Here's a brief summary:

Graphing $y = a(x - h)^2 + k$ and $y = ax^2 + bx + c$

1. If $a > 0$, the graph opens upward. If $a < 0$, the graph opens downward.
2. The vertex of $y = a(x - h)^2 + k$ is (h, k).



3. The x-coordinate of the vertex of $y = ax^2 + bx + c$ is $x = -\frac{b}{2a}$.

Definition of a Parabola

A **parabola** is the set of all points in a plane that are equidistant from a fixed line, the **directrix**, and a fixed point, the **focus**, that is not on the line (see **Figure 9.29**).

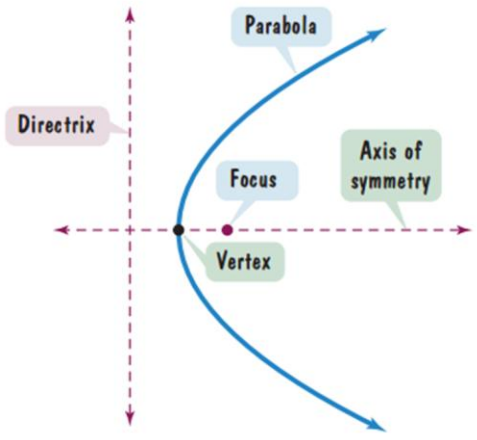


FIGURE 9.29

Axis of Symmetry: _____

_____

_____

Vertex: _____

_____

_____

Standard Equation of a Parabola

The **standard form of the equation of a parabola** with vertex at (h, k) is as follows.

$(x - h)^2 = 4p(y - k),\ p \neq 0$ Vertical axis, directrix: $y = k - p$

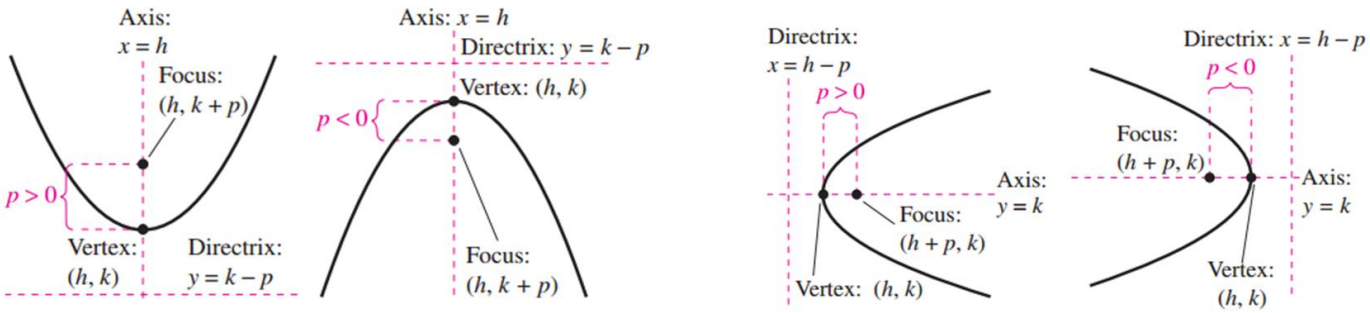
$(y - k)^2 = 4p(x - h),\ p \neq 0$ Horizontal axis, directrix: $x = h - p$

The focus lies on the axis p units (*directed distance*) from the vertex. If the vertex is at the origin $(0, 0)$, the equation takes one of the following forms.

$x^2 = 4py$ Vertical axis

$y^2 = 4px$ Horizontal axis

See Figure 10.11.



(a) $(x - h)^2 = 4p(y - k)$ Vertical axis: $p > 0$

(b) $(x - h)^2 = 4p(y - k)$ Vertical axis: $p < 0$

(c) $(y - k)^2 = 4p(x - h)$ Horizontal axis: $p > 0$

(d) $(y - k)^2 = 4p(x - h)$ Horizontal axis: $p < 0$

FIGURE 10.11

1.) Find the vertex, focus, and directrix of the parabola given by: $(x-3)^2 = 8(y+1)$.

Then graph it.

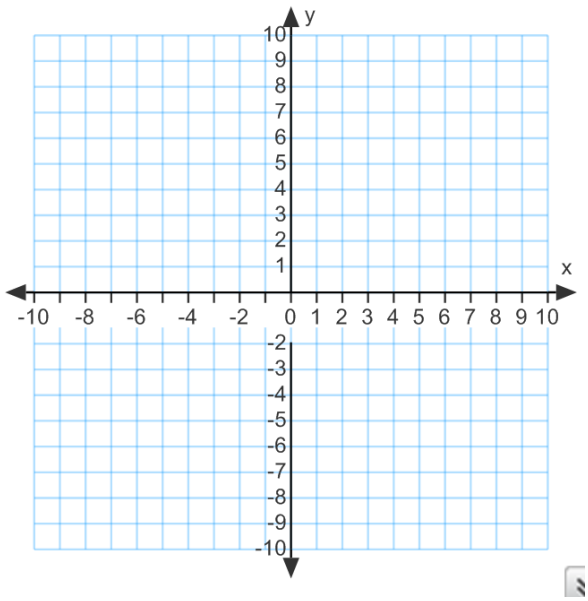
Coordinate of Vertex:

Direction it opens:

Axis of Symmetry:

Coordinates of Focus:

Equation of Directrix:



2.) Find the vertex, focus, and directrix of the parabola given by: _____.

Then graph it.

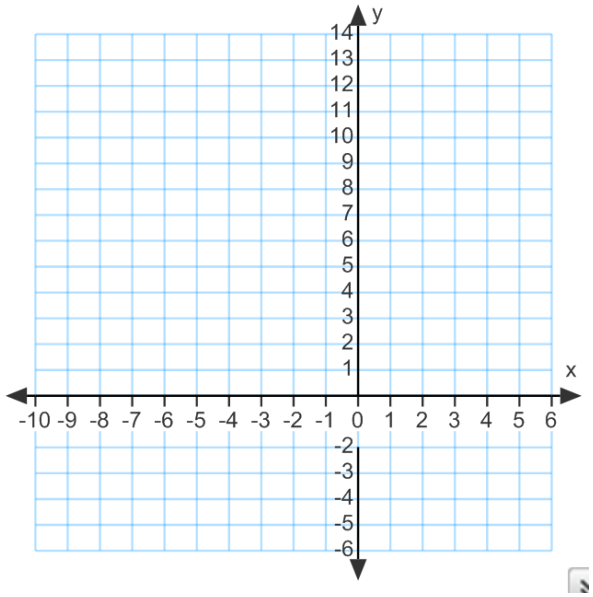
Coordinate of Vertex:

Direction it opens:

Axis of Symmetry:

Coordinates of Focus:

Equation of Directrix:



3.) Find the vertex, focus, and directrix of the parabola given by: $y^2 + 2y + 12x - 23 = 0$***.***

Then graph it.

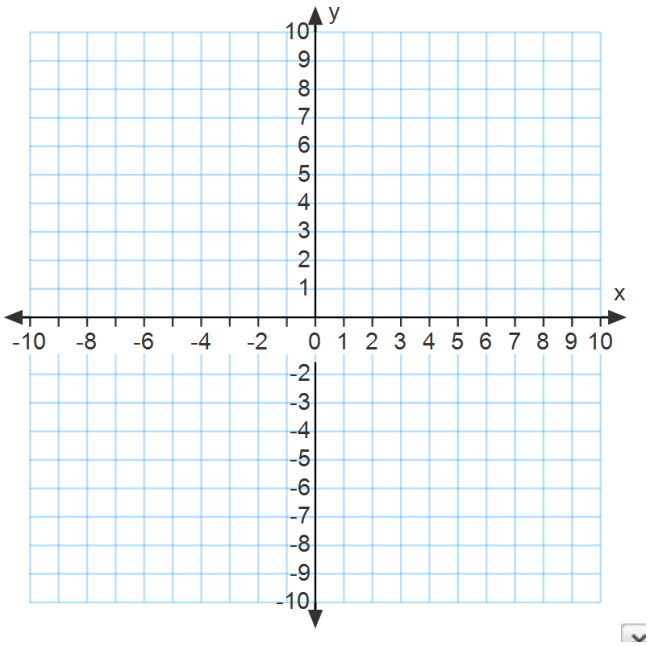
Coordinate of Vertex:

Direction it opens:

Axis of Symmetry:

Coordinates of Focus:

Equation of Directrix:



4.) Find the vertex, focus, and directrix of the parabola given by: _____ .

Then graph it.

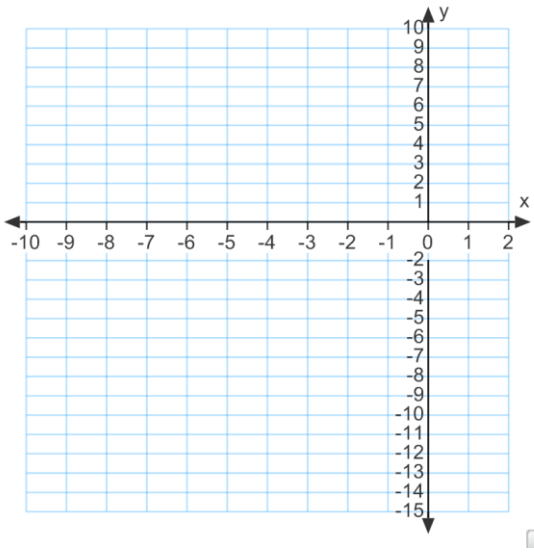
Coordinate of Vertex:

Direction it opens:

Axis of Symmetry:

Coordinates of Focus:

Equation of Directrix:



5.) Find the vertex, focus, and directrix of the parabola given by: $y = -\frac{1}{2}x^2 - x + \frac{1}{2}.$

Then graph it.

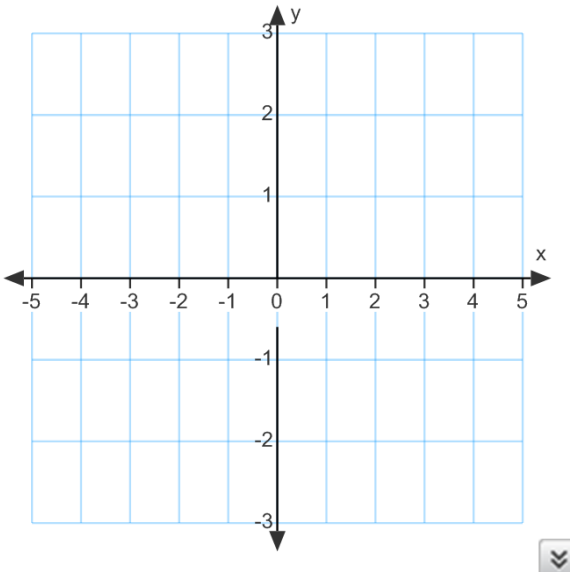
Coordinate of Vertex:

Direction it opens:

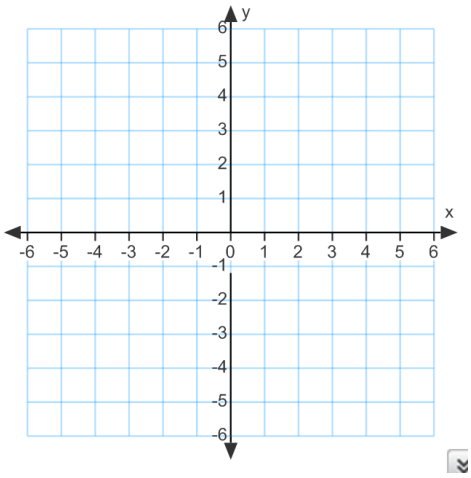
Axis of Symmetry:

Coordinates of Focus:

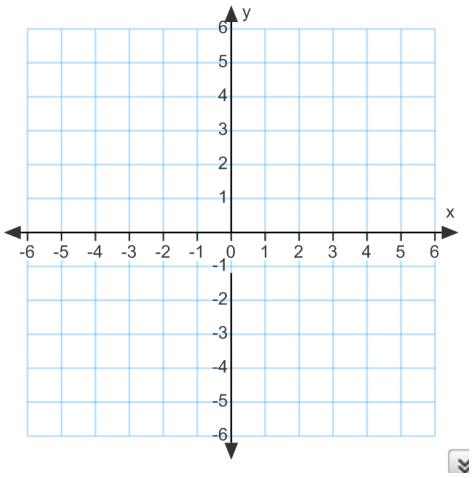
Equation of Directrix:



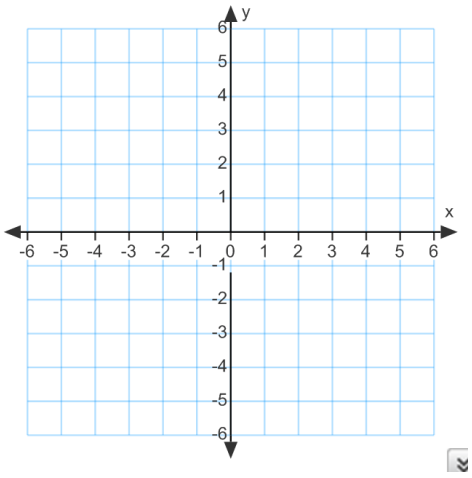
6.) Find the standard form of a parabola with vertex at the origin and focus (0, 4).



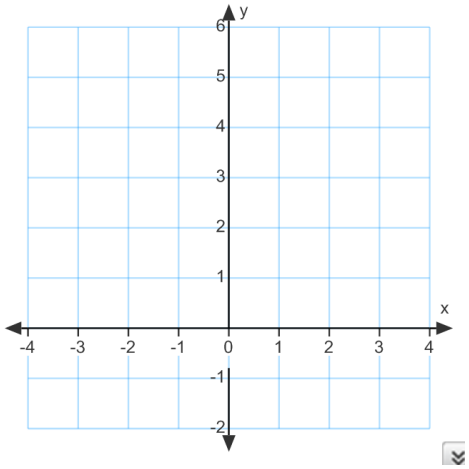
7.) Find the standard form of a parabola with vertex (1, 0) and focus (2, 0).



8.) Find the standard form of a parabola with :



9.) Find the standard form of a parabola with:



10.) Find the standard form of the equation of the parabola if the vertex is (0, 4) and the directrix is y = 2.