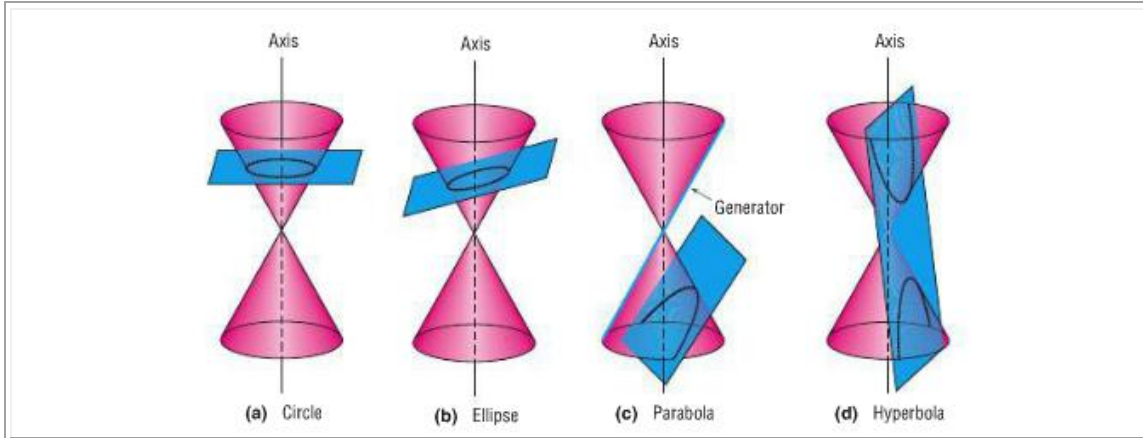
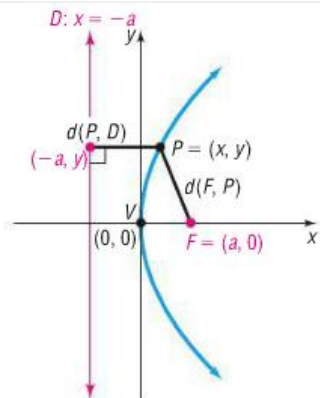


Precalculus
Lesson 10.1 and 10.2: Conics and the Parabola
Mrs. Snow, Instructor

Conic sections are curves that result from the intersection of a cone and a plane. We will be looking at all four curves: circle, parabola, ellipse and the hyperbola.



Parabola: A collection, or locus, of all points P in the plane that are the same distance from a fixed point as they are from a fixed line. The point F is the **focus** and the line is its **directrix**.



these distances are equal:

$$d(F, P) = d(P, D)$$

For the parabola that opens along the x-axis:

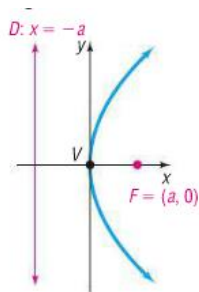
$$y^2 = 4ax$$

where:

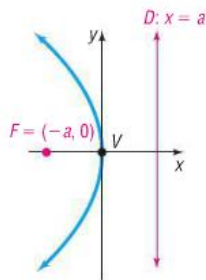
vertex at (0, 0), focus at (a, 0),
"a" is the distance from the vertex to the focus of a parabola

A parabola will open onto the positive or negative x- or y-axes:

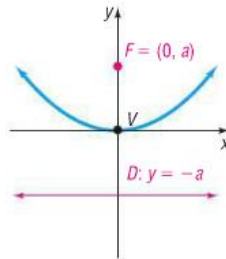
Equations of a Parabola, Vertex at (0, 0) and the Focus is on an Axis				
vertex	focus	directrix	equation	description
(0, 0)	(a, 0)	$x = -a$	$y^2 = 4ax$	opens on the positive x-axis
(0, 0)	(-a, 0)	$x = a$	$y^2 = -4ax$	opens on the negative x-axis
(0, 0)	(0, a)	$y = -a$	$x^2 = 4ay$	opens on the positive y-axis
(0, 0)	(0, -a)	$y = a$	$x^2 = -4ay$	opens on the negative y-axis



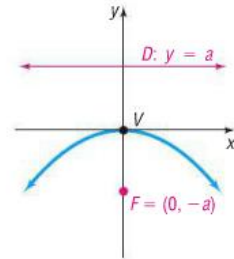
(a) $y^2 = 4ax$



(b) $y^2 = -4ax$



(c) $x^2 = 4ay$

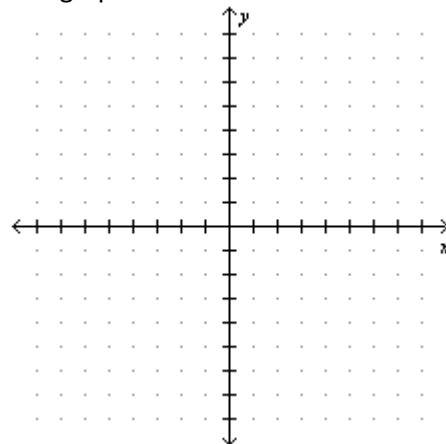


(d) $x^2 = -4ay$

Analyze the Equation of a Parabola

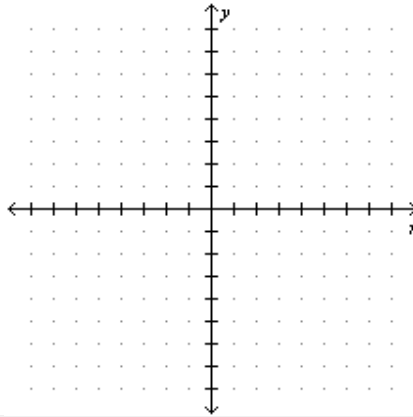
Analyze the equation: $y^2 = 8x$
analyze??? (find the vertex, focus and directrix and graph)

and graph:



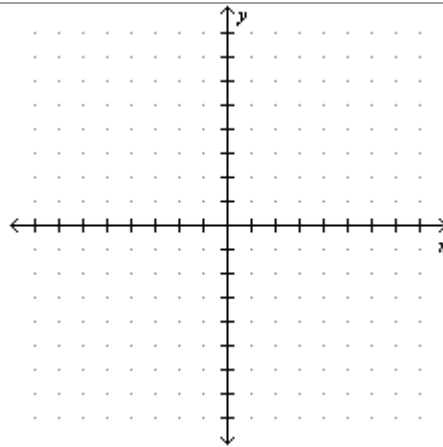
Analyze the equation: $x^2 = -12y$
(find the vertex, focus and directrix and graph)

and graph:

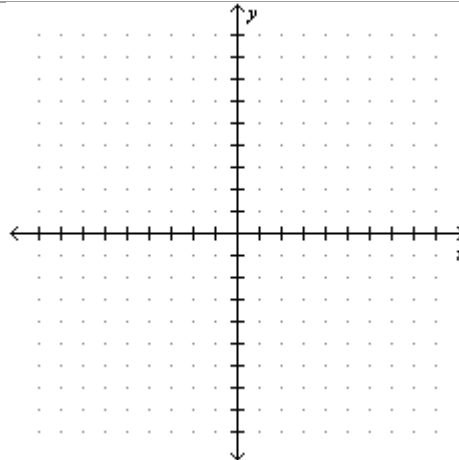


Graphing and Finding Equations of Parabolas

Find an equation of a parabola with a vertex at $(0,0)$ and a focus at $(3,0)$.
Graph the equation



Find an equation of a parabola with a focus at $(0,4)$ and a directrix line $y = -4$.
Graph the equation



Find the equation of the parabola with vertex at $(0, 0)$ if its axis of symmetry is the x-axis and its graph contains the point $(-\frac{1}{2}, 2)$

And yes, parabolas may be translated:

Equations of a Parabola; Vertex at (h, k) ; Axis of Symmetry Parallel to a Coordinate Axis				
vertex	focus	directrix	equation	description
(h, k)	$(h + a, k)$	$x = h - a$	$(y - k)^2 = 4a(x - h)$	opens right
(h, k)	$(h - a, k)$	$x = h + a$	$(y - k)^2 = -4a(x - h)$	opens left
(h, k)	$(h, k + a)$	$y = k - a$	$(x - h)^2 = 4a(y - k)$	opens up
(h, k)	$(h, k - a)$	$y = k + a$	$(x - h)^2 = -4a(y - k)$	opens down

(a) $(y - k)^2 = 4a(x - h)$

(b) $(y - k)^2 = -4a(x - h)$

(c) $(x - h)^2 = 4a(y - k)$

(d) $(x - h)^2 = -4a(y - k)$

Finding the Equation of a Parabola, Vertex Not at the Origin

Find an equation of the parabola with vertex at $(-2, 3)$ and focus at $(0, 3)$. Graph.

Analyzing the Equation of a Parabola, (find the vertex, focus and directrix and graph)

$x^2 + 4x - 4y = 0$