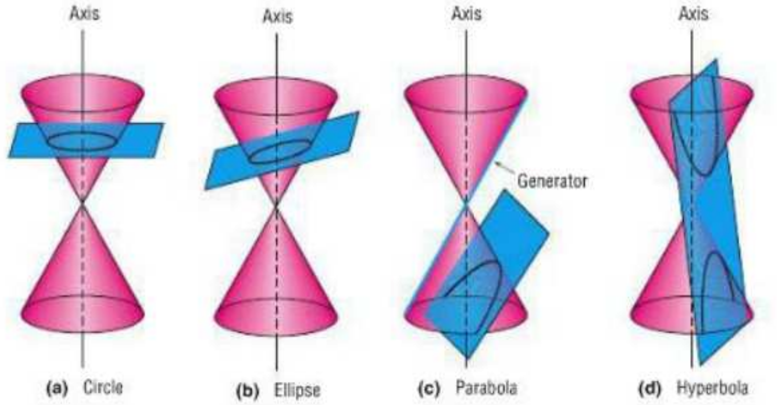
7-2 Notes Conics and the Parabola Name ______________________

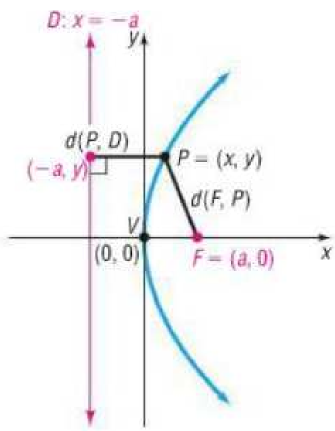
Pre-Calculus

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.



I. Parabola

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)

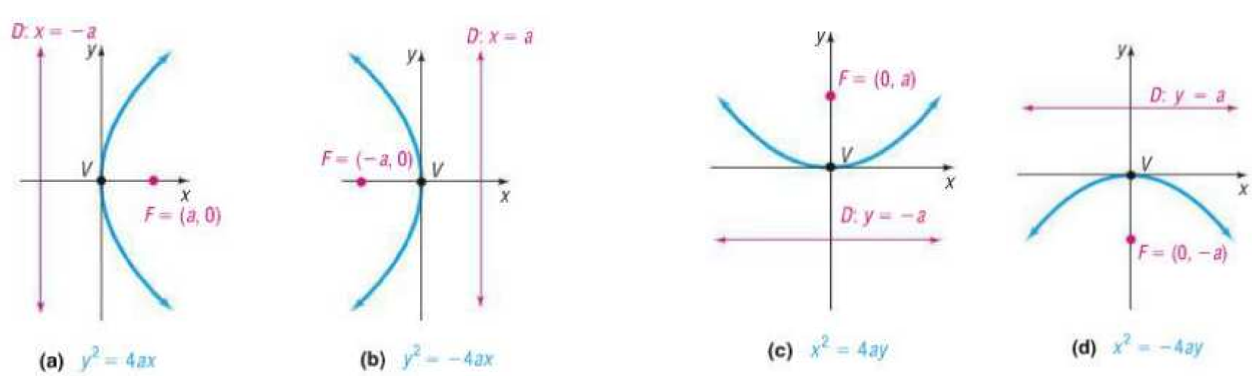
"a "is the distance from the vertex to the focus of a parabola

A. Graphs with Vertex at (0, 0)

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

equation	vertex	focus	directrix	description
$y^2 = 4ax$ $y^2 = -4ax$	(0, 0) (0, 0)	(a, 0) (-a, 0)	x = - a x = a	opens on the positive x axis opens on the negative x-axis
$x^2 = 4ay$ $x^2 = -4ay$	(0, 0) (0, 0)	(0, a) (0, -a)	y = -a y = a	open on the positive y-axis opens on the negative y-axis

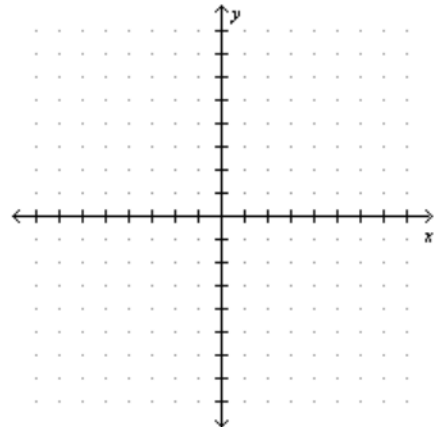


1. Analyze the equation and graph $y^2 = 8x$.

vertex:

focus:

directrix:

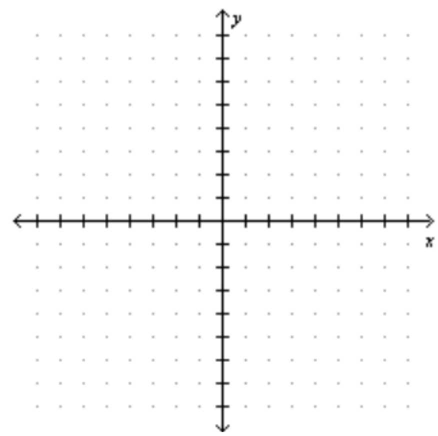


2. Analyze the equation and graph $x^2 = -12y$.

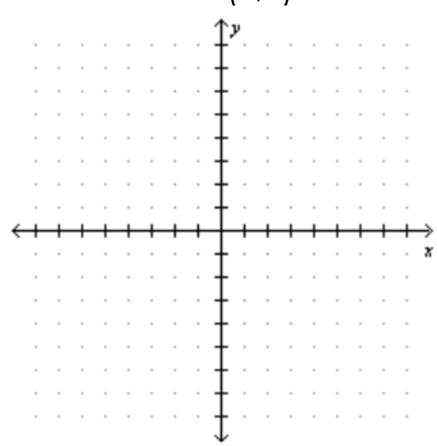
vertex:

focus:

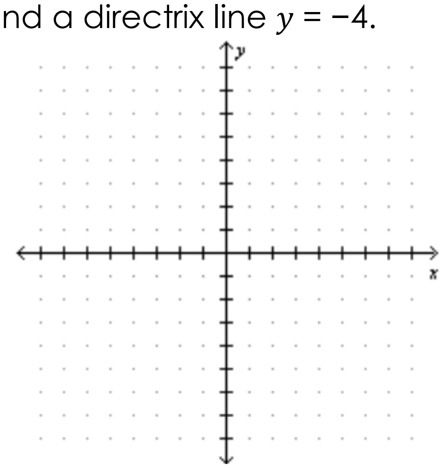
directrix:



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



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

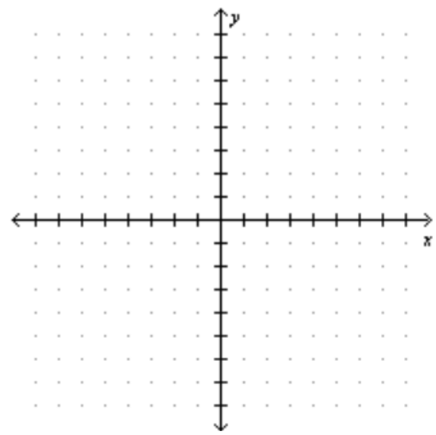


5. Find the equation of the parabola with vertex at (0, 0) if its axis of symmetry is the x-axis and its graph contains the point (- ½ , 2).

B. Graphs with Vertex and (h, k)

equation	**vertex**	**focus**	**directrix**	**description**
$(y - k)^2 = 4a(x - h)$ $(y - k)^2 = -4a(x - h)$	(h, k) (h, k)	(h + a, k) (h – a, k)	x = h – a x = h + a	opens right opens left
$(x - h)^2 = 4a(y - k)$ $(x - h)^2 = -4a(y - k)$	(h, k) (h, k)	(h, k + a) (h, k – a)	y = k – a y = k +a	opens up opens down

6. Find an equation of the parabola with vertex at (−2, 3) and focus at (0, 3).



7. Analyze the equation and graph $x^2 + 4x - 4y = 0$.

vertex:

focus:

directrix: