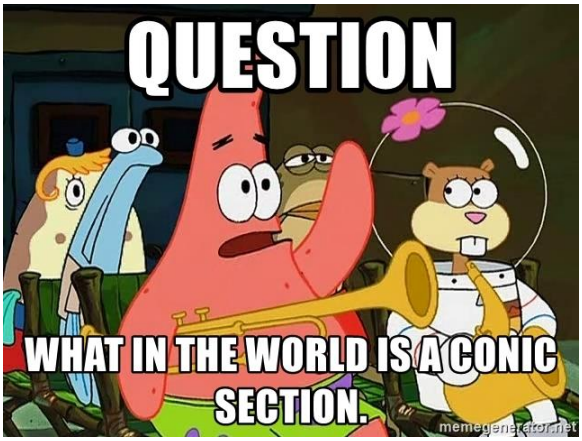
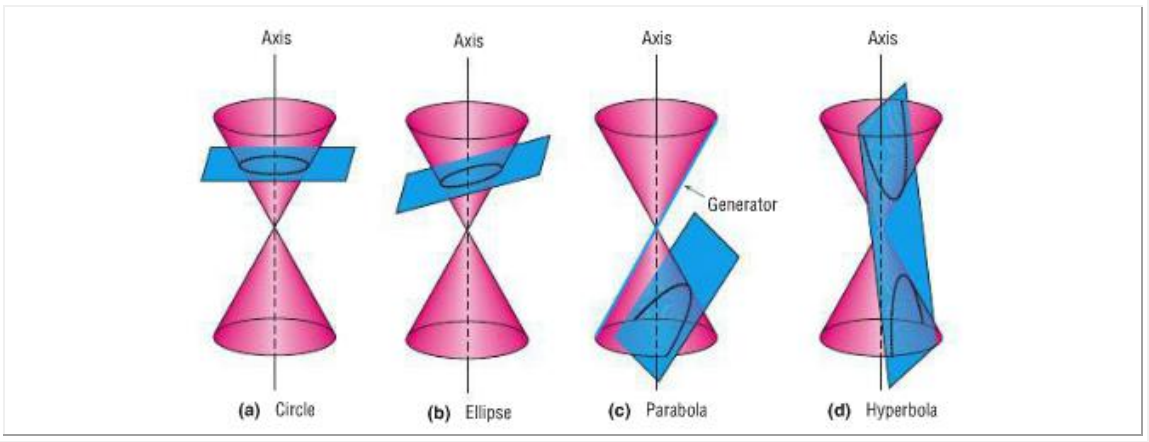
Precalculus
Lesson 10.2: The Parabola
Mrs. Snow, Instructor

I will *be able to graph a parabola with the vertex at the origin and solve real world examples involving parabolas*

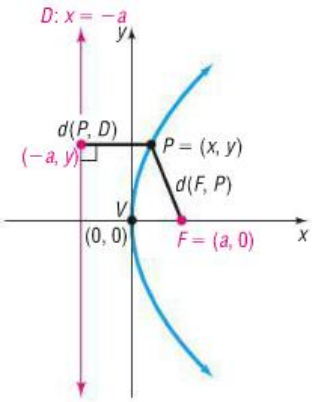
We will: *Analyze parabolas with a vertex at the origin and solve application problems involving parabolas*



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:

$$\boldsymbol{y^2 = 4ax}$$

where:

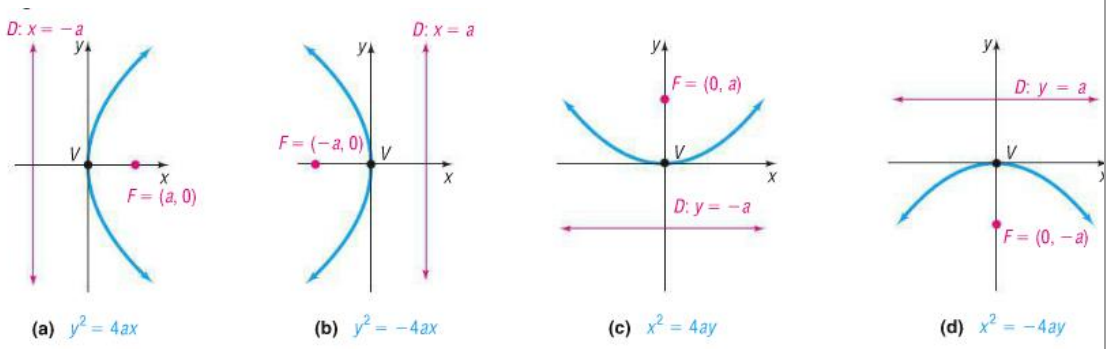
$\boldsymbol{vertex\ at\ (0,0)}$, $\boldsymbol{focus\ at\ (a,0)}$,

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

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
$(0,0)$ $(0,0)$	$(a,0)$ $(-a,0)$	$x=-a$ $x=a$	$y^2=4ax$ $y^2=-4ax$	opens on the positive x-axis opens on the negative x-axis
$(0,0)$ $(0,0)$	$(0,a)$ $(0,-a)$	$y=-a$ $y=a$	$x^2=4ay$ $x^2=-4ay$	opens on the positive y-axis opens on the negative y-axis



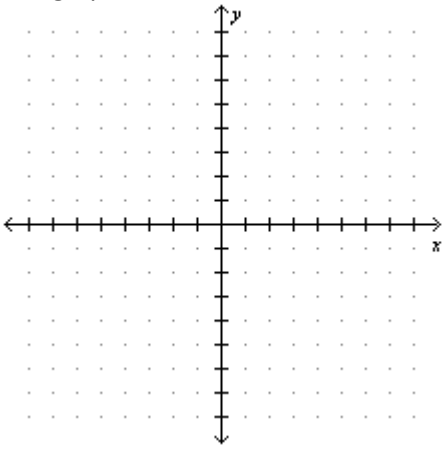
(a) $y^2=4ax$ (b) $y^2=-4ax$ (c) $x^2=4ay$ (d) $x^2=-4ay$

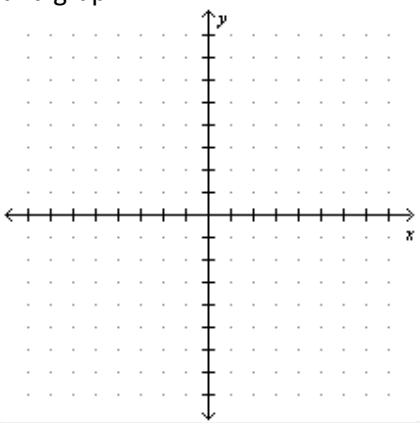
Analyze the Equation of a Parabola

Analyze the equation: $y^2=8x$

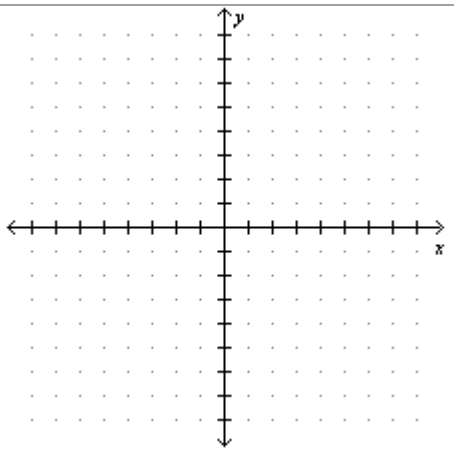
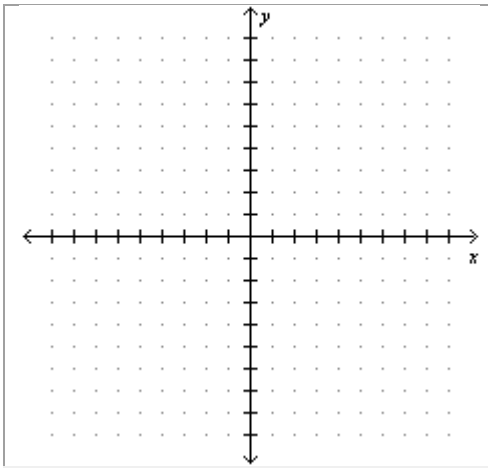
analyze??? (find the vertex, focus and directrix and graph)

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 and 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 contain the point $(-\frac{1}{2}, 2)$

A satellite dish is shaped like a paraboloid of revolution. The signals that emanate from a satellite strike the surface of the dish and are reflected to a single point, where the receiver is located. If the dish is 8 feet across at its opening and 3 feet deep at its center, at what position should the receiver be placed? That is, where is the focus?

(a)