Parabolas

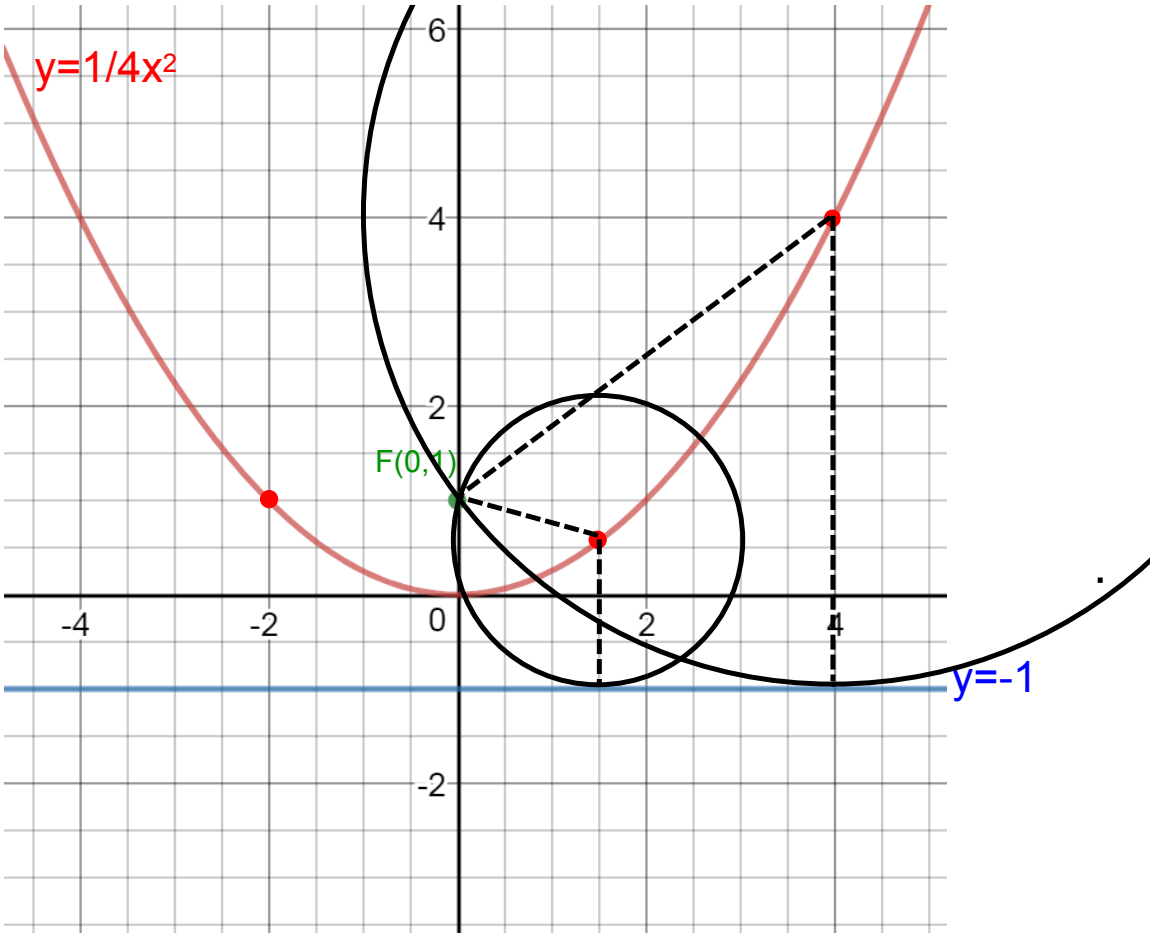
Goal:

- to understand the characteristics of parabolas with vertex at (0,0)

- to find the equation of any parabola with vertex at (0,0)

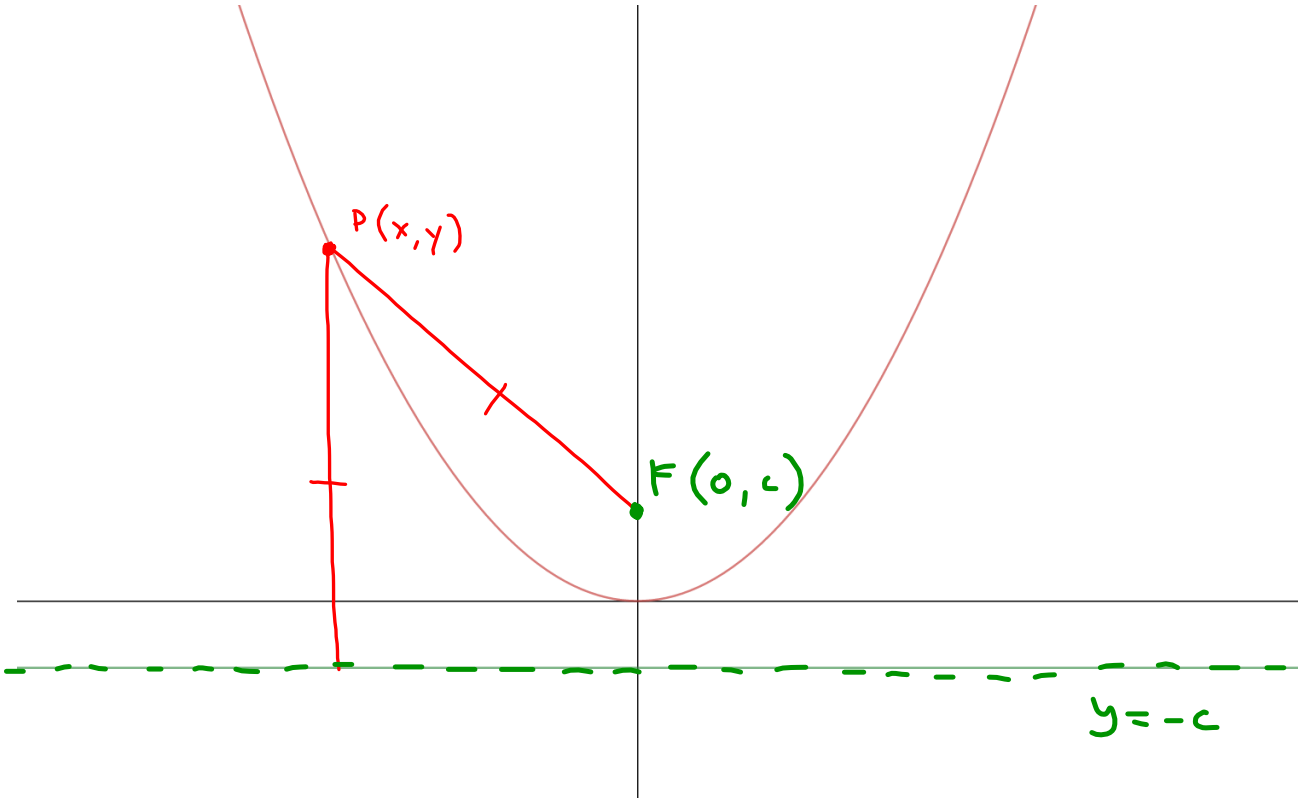
We know parabolas from our study of quadratic functions, but now we want to focus in on the shape itself.

Like the other conic sections a parabola has a focus. The parabola is also defined by a line called the directrix.


y=1/4x²
F(0,1)
y=-1
6
4
2
-2
-4
-2
0
2
4

Parabola definition: A set of points where each point is equidistant from a fixed point, called the focus, and a line, called the directrix.

$$d(PF) = d(Pl_d)$$

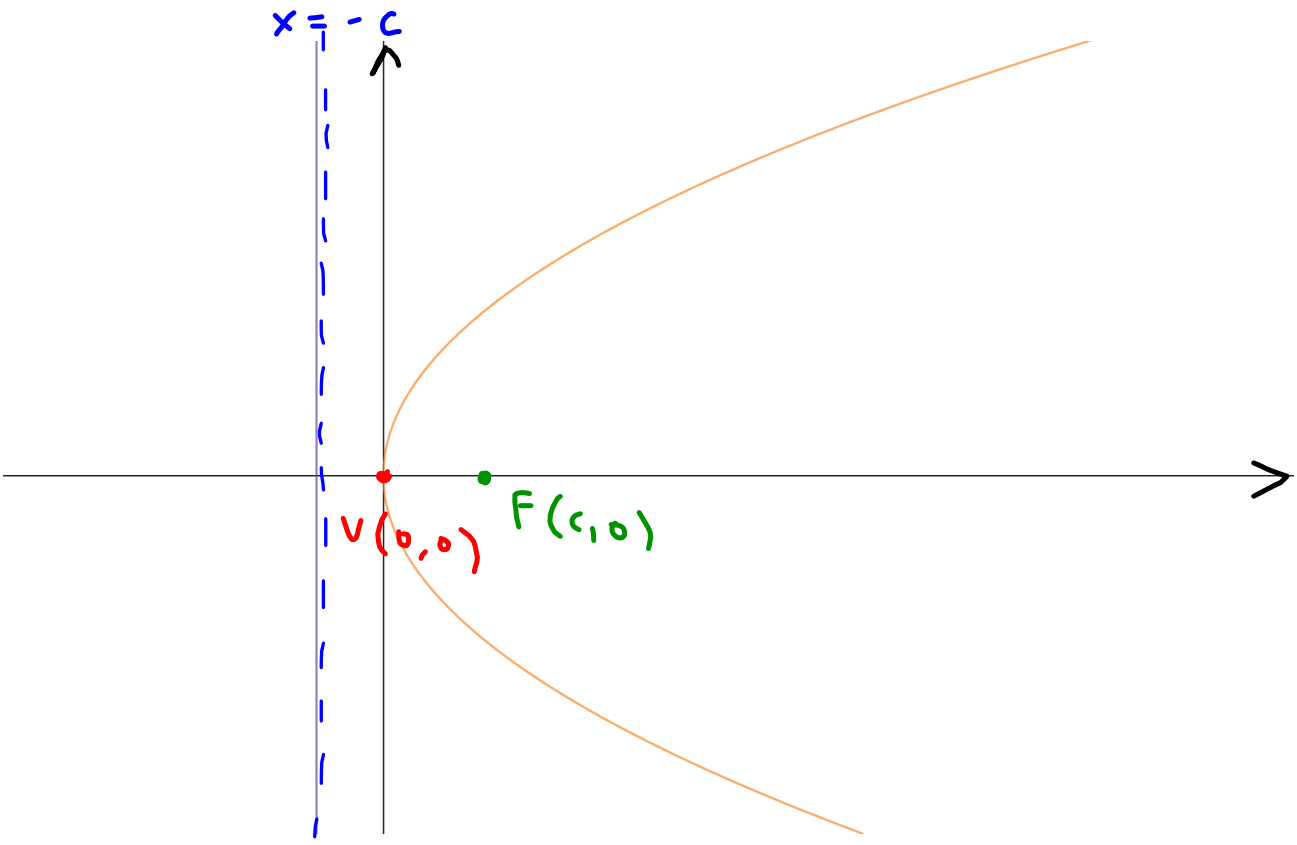


The equation for any parabola with a vertex at (0,0) which opens up or down in standard form is:

In this context we aren't using $y=ax^2$

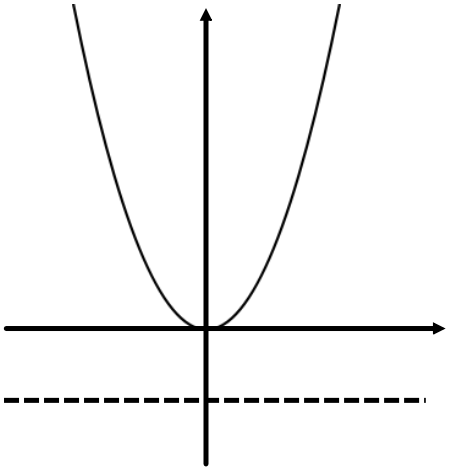
$$x^2 = 4cy$$

A parabola can also have a left/right opening.

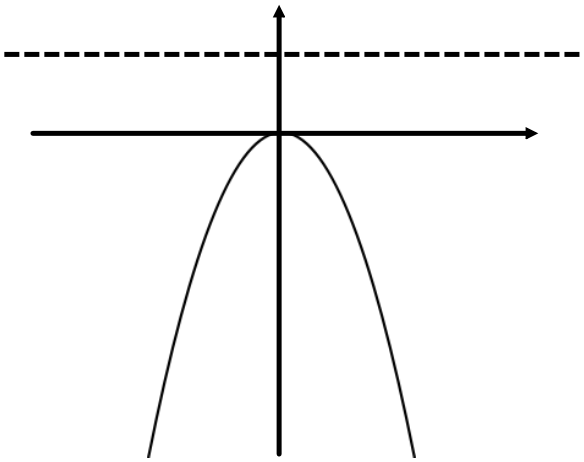


The equation of any parabola with vertex at (0,0) which opens left or right in standard form is:

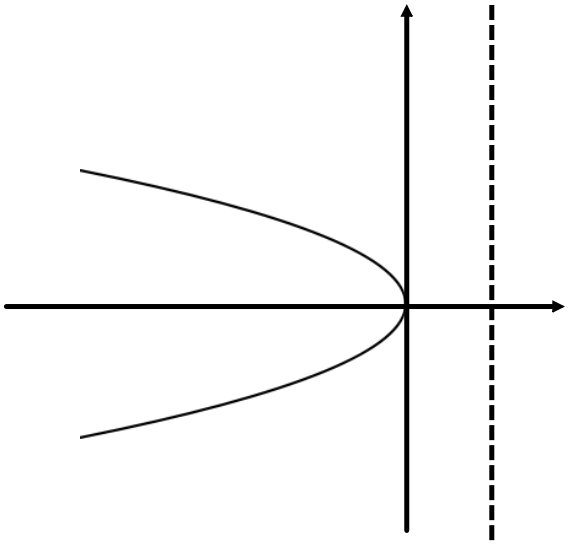
$$y^2 = 4cx$$



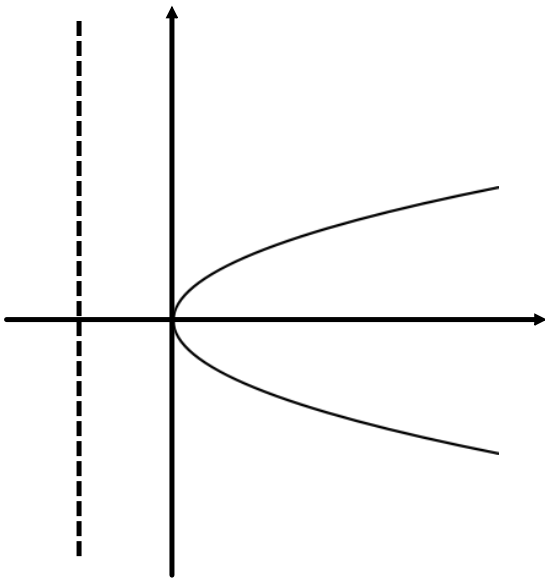
Parabola open up
Equation: $4cy=x^2$
Directrix: $y=-c$
Focus: $(0,c)$



Parabola open down
Equation: $4cy=x^2$
Directrix: $y=-c$
Focus: $(0,c)$

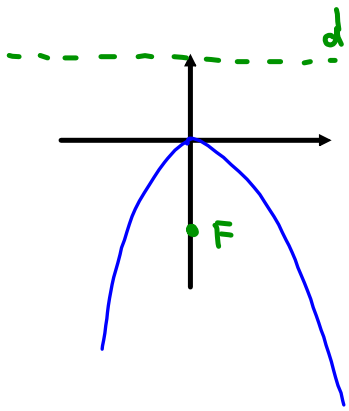


Parabola open left
Equation: $4cx=y^2$
Directrix: $x=-c$
Focus: $(c,0)$



Parabola open right
Equation: $4cx=y^2$
Directrix: $x=-c$
Focus: $(c,0)$

Ex: A parabola is defined by the rule $x^2=-18y$. Determine the coordinates of the focus, the equation of th directrix and the equation of the axis of symmetry.



$4c = -18$

$c = \frac{-18}{4}$

$c = -\frac{9}{2} = -4.5$

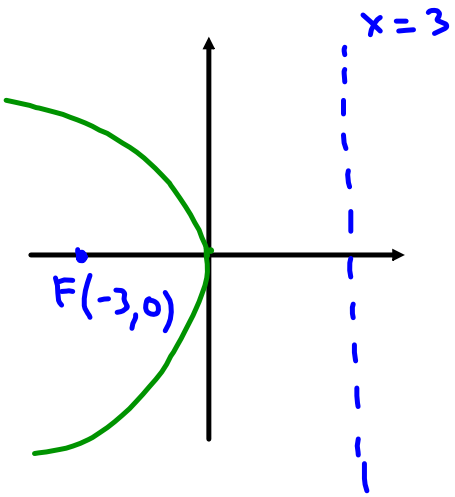
$F\ (0, -4.5)$

directrix : $y = 4.5$

axis of sym : $x = 0$

Ex: Find the equation of a parabola that has a vertex at (0,0) and a directrix at x=3. Does this parabola pass through the point (-2,0.5)?

p. 193
#1, 2, 7
V(0,0)
only



$y^2 = 4cx$

$c = -3$

$y^2 = -12x$

$= -12(-2)$

$y^2 = 24$

$y = \pm\sqrt{24} \neq 0.5$

$y = \pm 2\sqrt{6} \neq 0.5$