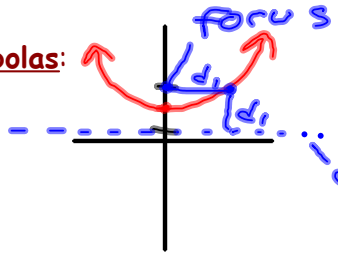
9-1 Introduction to Conics: Parabolas

Conics—Take a look at Page 632 to see what they are.

Parabolas:



p is the distance from the vertex to either focus/directrix.

Standard Form of a Parabola: vertex = (h, k)

$(x - h)^2 = 4p(y - k)$ Vertical axis of symmetry

$(y - k)^2 = 4p(x - h)$ Horizontal axis of symmetry

At Origin: $x^2 = 4py$

$y^2 = 4px$

Find the vertex, focus, and directrix of the parabola and sketch.

Ex 1) $y = (1/2)x^2$

$2y = x^2$

$x^2 = 2y$

$x^2 = 4py$

$2y = 4py$

$2 = 4p$

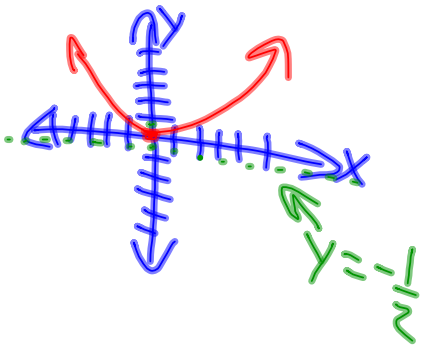
$\frac{1}{2} = p$

p is pos. ∴ goes up

Vertex: (0,0)

Focus: $(0, \frac{1}{2})$

Directrix: $y = -\frac{1}{2}$



Ex2) $y = -.5x^2 - x + .5$

$-2y = x^2 + 2x - 1$

$+1 \quad +1$

$-2y + 1 = x^2 + 2x + 1$

$(\frac{2}{2})^2 = 1^2$

$-2y + 2 = (x + 1)^2$

$(x+1)^2 = -2y + 2$

$(x+1)^2 = -2(y - 1)$

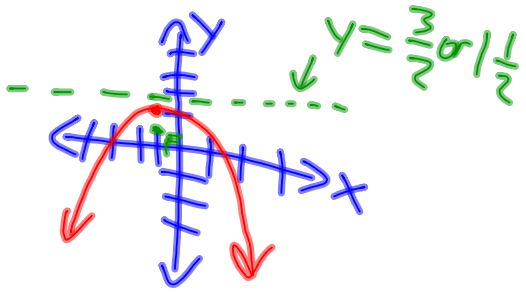
$-2 = 4p$

$-\frac{1}{2} = p$

Vertex: $(-1, 1)$

Focus: $(-1, \frac{1}{2})$

Directrix: $y = \frac{3}{2}$



Ex 3) $(x + 1)^2 + 8(y + 3) = 0$

$(x+1)^2 = -8(y+3)$

Focus

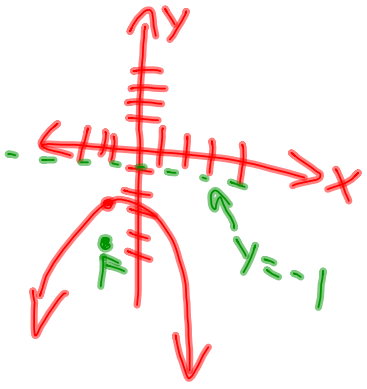
$4p = -8$

$p = -2$

Vertex: $(-1, -3)$

Focus: $(-1, -5)$

Directrix: $y = -1$



Ex 4) $x^2 + 4x + 6y - 2 = 0$

Vertex: $(-2, 1)$

Focus: $(-2, -\frac{1}{2})$

Directrix: $y = 2\frac{1}{2}$

$x^2 + 4x + 4 = -6y + 2 + 4$

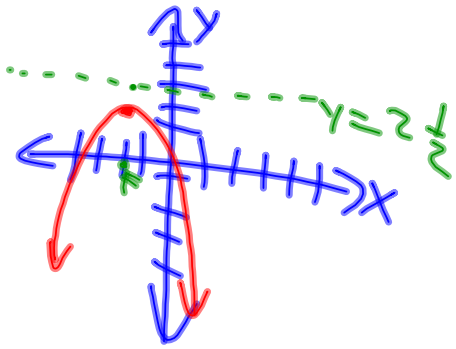
$\frac{4}{2} = 2^2$

$(x + 2)^2 = -6y + 6$

$(x + 2)^2 = -6(y - 1)$

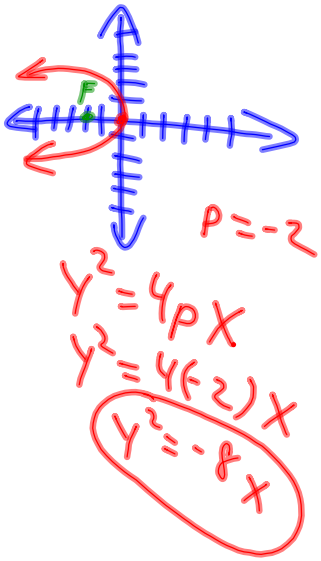
$-6 = 4p$

$-\frac{3}{2} = p$



Find the standard form of the equation of the parabola with vertex at the origin.

Ex 5) Focus: (-2, 0)



$p = -2$

$y^2 = 4px$

$y^2 = 4(-2)x$

$y^2 = -8x$

Ex 6) Directrix: y = -1