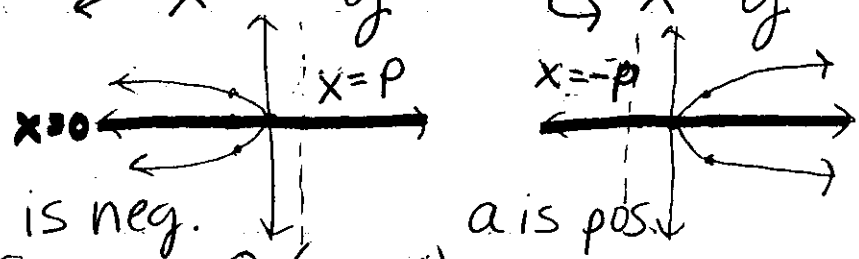
Parabolas that open LEFT & Right

Graph $y = x^2$ $\quad y = -x^2$

Find the inverses

(make table, Flip x and y values)

vertex (0,0) $\quad x = -y^2$ $\quad x = y^2$



$x = ay^2$

↳ FOCUS $(p, 0)$

↳ FOCUS $(-p, 0)$ a is neg. a is pos.

axis OF symmetry $y = 0$ (x-axis)

$p = \frac{1}{4} \cdot$ reciprocal OF a

vertex (h, k) $\quad x = a(y-k)^2 + h$

↳ axis OF symmetry $y = k$ ↳ $y = k$

directrix $x = -p$ $x = p$

FOCUS

<u>Example 1</u>: Put in standard FORM

Find the vertex, FOCUS, directrix, and axis OF symmetry.

$\frac{y^2}{8} = \frac{8x}{8}$

$x = \frac{1}{8}y^2$

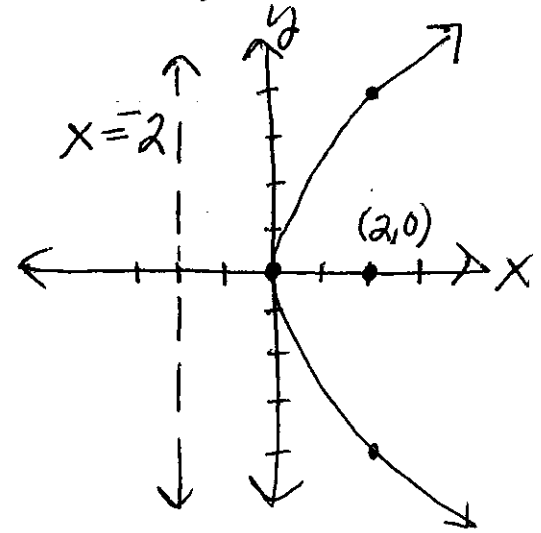
$p = \frac{1}{4} \cdot \frac{8}{1} = 2$

F: (2,0)

D: $x = -2$

Ax: $y = 0$

V: (0,0)



EX 2

Put in standard form. Find all pertinent info. and sketch the graph.

$$x = 2y^2 + 8y + 9$$

$$x - 9 = 2(y^2 + 4y + \boxed{4})$$

(+2 [4])

$$x - 9 + 8 = 2(y+2)^2$$

(+1)

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

(+1)

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

Vertex: $(1, -2)$

opens Right

$a = 2$

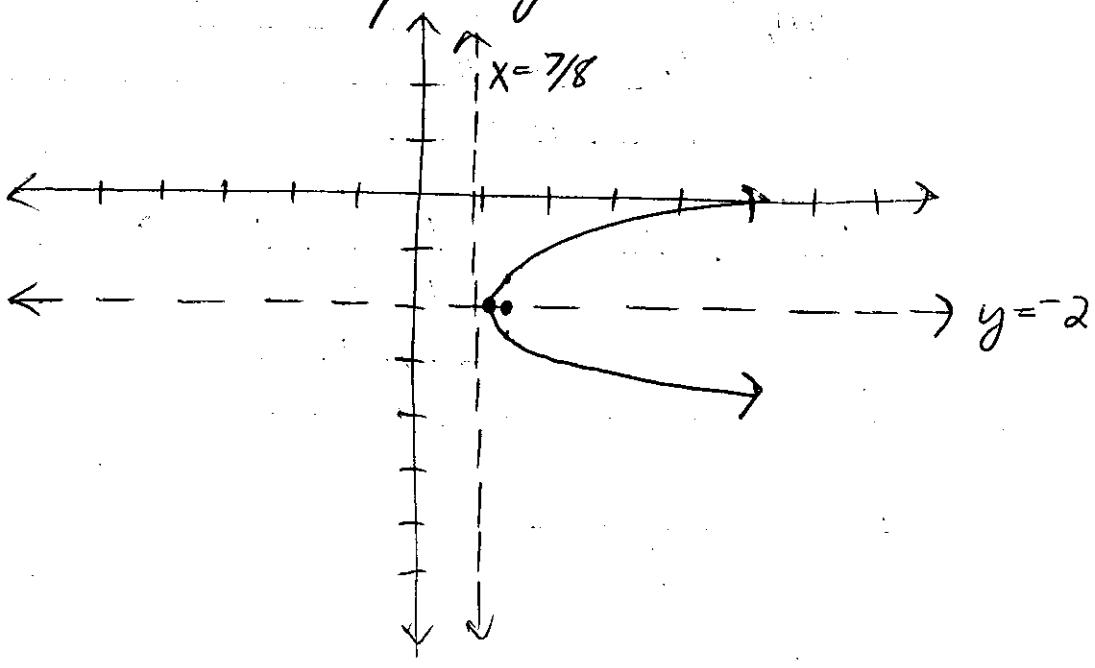
$p = \frac{1}{4} \cdot \frac{1}{2} = \frac{1}{8}$

Focus: $(1 + \frac{1}{8}, -2)$

$(1\frac{1}{8}, -2)$

Directrix: $x = 1 - 1/8 \rightarrow x = 7/8$

Axis of symmetry: $y = -2$



EX 2) $x = 2y^2 - 8y + 3$

Standard FORM

$x - 3 = 2(y^2 - 4y + \boxed{4})$

$+2\boxed{4}$

$x + 5 = 2(y-2)^2$

$x = 2(y-2)^2 - 5$

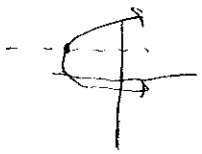
vertex: $(-5, 2)$

FOCUS: $(-5 + 1/8, 2)$

$(-4\,7/8, 2)$

$p = \frac{1}{4} \cdot \frac{1}{2} = \frac{1}{8}$

opens right



Directrix: $x = -5 - 1/8 \rightarrow x = -5\,1/8$

axis OF symmetry: $y = 2$

EX 3.) $x = y^2 - 4y + 4$

$x = (y-2)^2$

$a = 1$

vertex: $(0, 2)$

FOCUS: $(1/4, 2)$

directrix: $x = -1/4$

$p = \frac{1}{4}$

opens right

axis OF Symmetry: $y = 2$

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

$\boxed{x = -\frac{1}{4}y^2}$ standard form.

vertex $(0,0)$

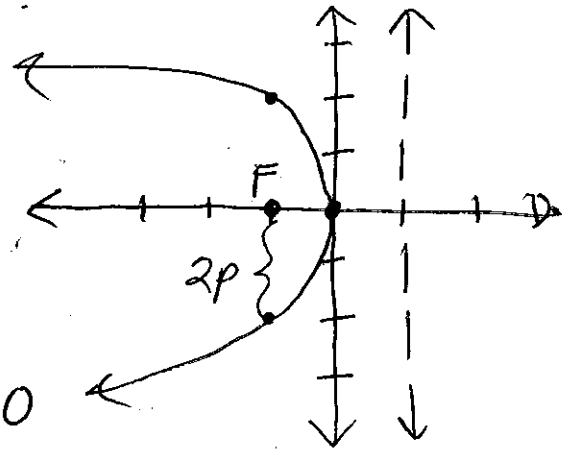
opens LEFT

$a = -\frac{1}{4}$ $p = \frac{1}{4} \cdot \frac{4}{-1} = -1$

FOCUS $(-1,0)$

directrix: $x = 1$

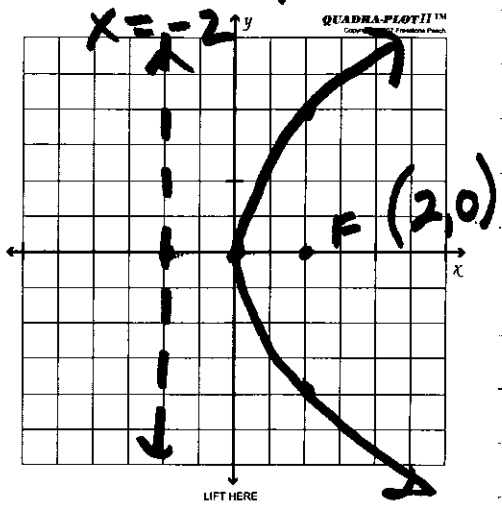
axis of symmetry: $y = 0$



ex2 $\frac{y^2}{8} = \frac{8x}{8}$ $\boxed{x = \frac{1}{8}y^2}$ opens right vertex (0,0)

$\frac{1}{8}y^2 = x$ $p = \frac{1}{4} \cdot \frac{8}{1} = 2$

directrix $x = -2$



A.O.S. $y = 0$

ex3 $2y^2 - 8y - x + 3 = 0$
$+x \quad -3 \quad +x - 3$

$2y^2 - 8y = x - 3$

$2(y^2 - 4y + \boxed{4}) = x - 3 + 2\boxed{4}$

$2(y-2)^2 = x + 5$
$-5 \quad -5$

$\boxed{x = 2(y-2)^2 - 5}$

ex3

$$y^2 - 2y + 16x - 31 = 0$$

$$y^2 - 2y + \boxed{1} = -16x + 31 + \boxed{1}$$

$$(y-1)^2 = -16x + 32$$

$$\frac{(y-1)^2}{-16} - \frac{32}{-16} = \frac{-16x}{-16}$$

$$\boxed{-\frac{1}{16}(y-1)^2 + 2 = x}$$

turn in if you get it done.

ex1 $x = -\frac{1}{24}(y-2)^2 - 3$

vertex $(\underset{h}{-3}, \underset{k}{2})$

$a = -\frac{1}{24}$ $\quad p = \frac{1}{4}\left(-\frac{24}{1}\right) = -6$

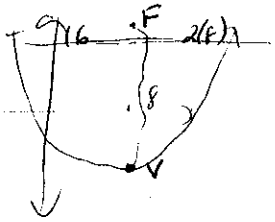
Focus: $(-9, 2)$

directrix: $x = 3$

axis of symmetry: $y = 2$

Examples

① Write the equation for a parabola with vertex at $(2,-3)$ and focus at $(2,5)$

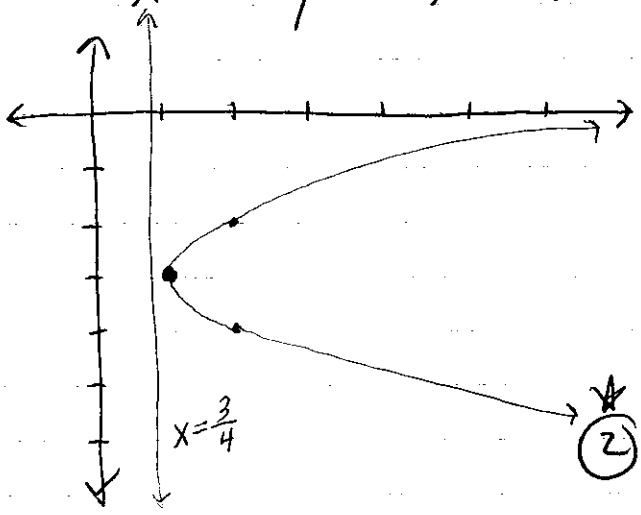


$p = 8$

$a = \frac{1}{4 \cdot 8} = \frac{1}{32}$

$$\boxed{y = \frac{1}{32}(x-2)^2 - 3}$$

$x = (y+3)^2 + 1$ ← answer



$p = \frac{1}{4}$

$a = \frac{1}{4 \cdot p} = \frac{1}{4 \cdot \frac{1}{4}} = \frac{1}{1} = 1$

$a = 1$ positive opens right

② From the Graph write the equation

③ $3y^2 - x - 6y + 5 = 0$

$3y^2 - x - 6y + 5 = 0$ $+x \ -5$ write in standard form.

$+x \quad -5$

$\frac{3y^2}{3} - \frac{6y}{3} = \frac{x}{3} - \frac{5}{3}$

$y^2 - 2y + \boxed{1} = \frac{1}{3}x - \frac{5}{3} + \boxed{1}$

$\left(\frac{1}{2} \cdot -2\right)^2$

$(y-1)^2 = \frac{1}{3}x - \frac{5}{3} + \frac{3}{3} - \frac{2}{3}$

$3\left[(y-1)^2 + \frac{2}{3}\right] = \left(\frac{1}{3} \cdot x\right)3$

$$\boxed{3(y-1)^2 + 2 = x}$$