

10.1(a) Parabolas

Ex. 1: Find the vertex, focus and directrix of the parabola given by $y = 0.5x^2$. Sketch the graph.

Looks like $x^2 = 4py$

① Solve for x^2 : $\frac{y}{.5} = x^2$ $\frac{y}{\frac{1}{2}} = x^2$ $2y = x^2$

② find p : $x^2 = \boxed{2}y \leftrightarrow x^2 = \boxed{4p}y$ (comparing problem to general equation)

set $2 = 4p$

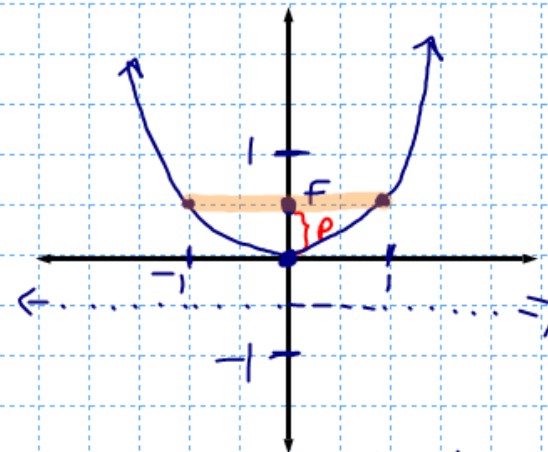
$$\frac{2}{4} = p$$

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

vertex: $(0, 0)$

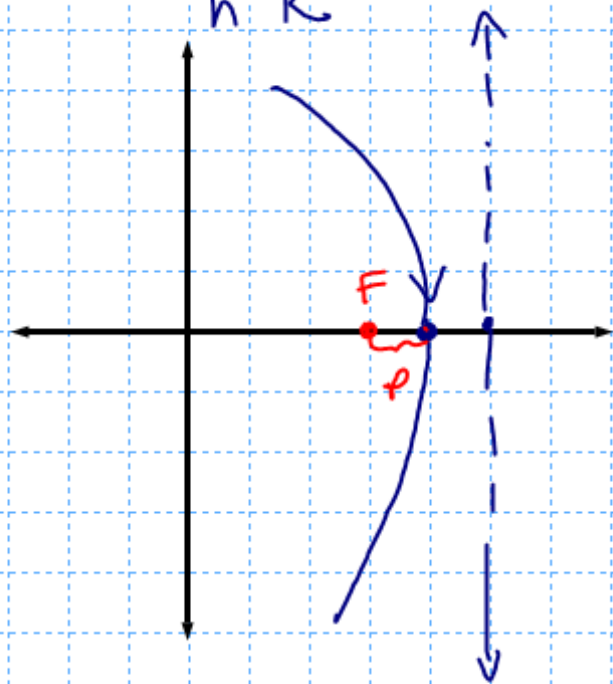
focus: $(0, \frac{1}{2})$

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



focal diameter = $|4p| = |2| = 2$

Ex. 2: Find an equation of a parabola with vertex $(4, 0)$ and directrix $x = 5$.



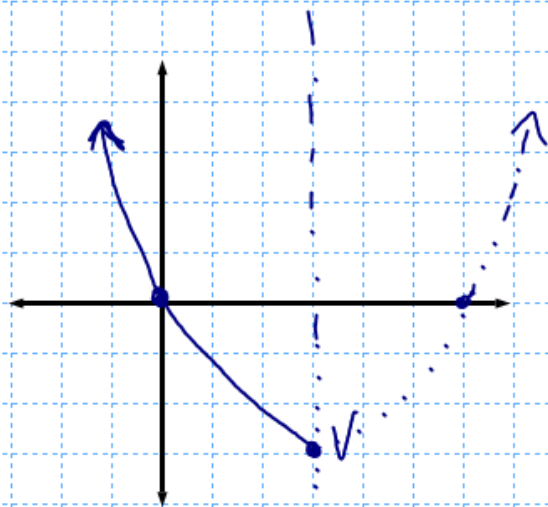
use $(y - k)^2 = 4p(x - h)$

$p = -1$

$$(y - 0)^2 = 4(-1)(x - 4)$$

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

Ex. 3: Find an equation in standard form with vertex $(3, -3)$, a vertical axis and passing through $(0, 0)$.



axis of symmetry

use $(x-h)^2 = 4p(y-k)$

$$(x-3)^2 = 4p(y+3)$$

use $(0, 0)$ to find p :

$$(0-3)^2 = 4p(0+3)$$

$$9 = 4p(3)$$

$$9 = 12p$$

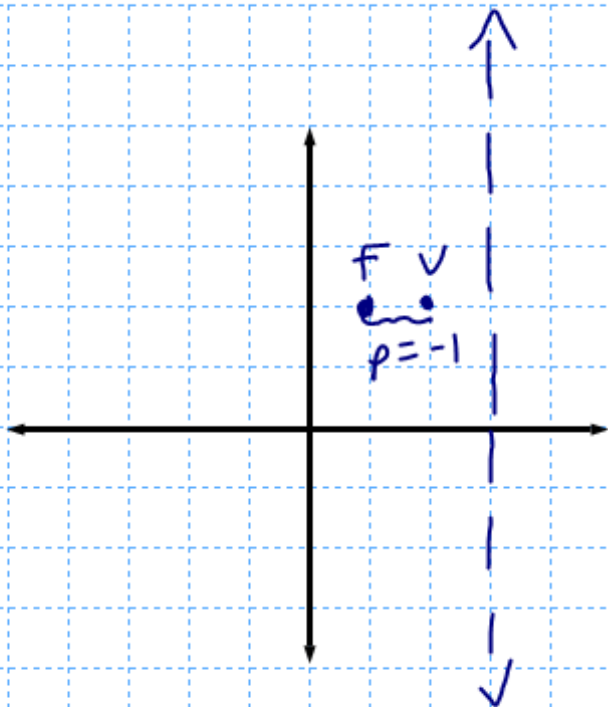
$$\frac{9}{12} = p$$

$$\frac{3}{4} = p$$

$$(x-3)^2 = 4\left(\frac{3}{4}\right)(y+3)$$

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

Ex. 4: Find an equation of the parabola with focus $(1, 2)$ and directrix $x = 3$.



- ① graph the info.
- ② - vertex is halfway in between the focus and the directrix

vertex $(2, 2)$

$$p = -1$$

- ③ use $(y - k)^2 = 4p(x - h)$

$$(y - 2)^2 = 4(-1)(x - 2)$$

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