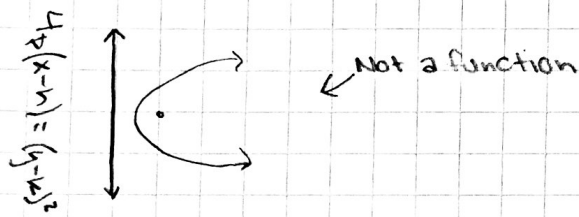


9.1 Parabolas

Conic section - as if you take a cone & cut it.

Parabola - the set of all points equidistant to a designated point (focus) & a designated line (directrix)



Yes a function

Distance between vertex & focus is p

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

Transformational/Conic Form

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

$$y = a(x-h)^2 + k$$

$$\frac{1}{a} \cdot y - k = a(x-h)^2 \cdot \frac{1}{a}$$

$$\frac{1}{a}(y-k) = (x-h)^2$$

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

ex: write in transformational/conic form

$$1) \quad y = -4(y-2)^2 + 7$$

$$\frac{1}{-4} \cdot y + 2 = -4(y-2)^2 \cdot \frac{1}{-4}$$

$$\frac{-1}{4}(y-7) = (y-2)^2$$

$$V: (7, 2)$$

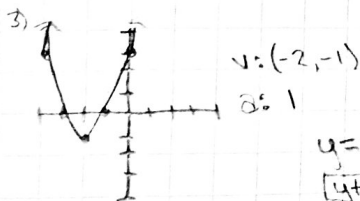
$$2) \quad y = 2(x+2)^2 - 6$$

$$\frac{1}{2} \cdot y + 6 = 2(x+2)^2 \cdot \frac{1}{2}$$

$$\frac{1}{2}(y+6) = (x+2)^2$$

$$V: (-6, -2)$$

Get the squared term by itself



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

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

ex: switch from standard form to transformational form

everything distributed out

$$4) x^2 + 2x + y - 9 = 0$$

$$-y + 9 \quad -y - 9$$

$$z = 2 = 1$$

$$x^2 + 2x + 1 = -y + 9$$

$$(x+1)^2 = -y+10$$

$$(x+1)^2 = -(y-10)$$

$$V: (-1, 10)$$

$$5) -4y^2 + x + 72y - 314 = 0$$

$$-4y^2 + 72y = -x + 314$$

$$-4(y^2 - 18y + 81) = -x + 314$$

$$-18 \cdot 2 = -9^2 = 81$$

$$-4(y-9)^2 = -x-10$$

$$-\frac{1}{4} \cdot -4(y-9)^2 = -\frac{1}{4}(-x-10) \cdot -\frac{1}{4}$$

$$(y-9)^2 = \frac{1}{4}(x+10)$$

$$V: (-10, 9)$$

★ for vertex start with "x" first ★

ex: write in transformational form

6) $V: (2, 5)$ focus: $(2, \frac{59}{12})$ (open vertically down)

$$p: -\frac{1}{12} \quad 5 - \frac{59}{12} = \frac{60}{12} - \frac{59}{12} = \frac{1}{12}$$

$$4p = \frac{4}{12} = \frac{1}{3} = -\frac{1}{3}$$

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

7) $V: (3, -8)$ f: $(\frac{8}{3}, -8)$ (opens horizontally left)

$$p: 3 - \frac{8}{3} = \frac{9}{3} - \frac{8}{3} = \frac{1}{3}$$

$$(y+8)^2 = -\frac{1}{3}(x-3)$$

$y = \dots$ is a vertical line.



a) $V(-6, -2)$ Directrix $y = \frac{3}{20}$
 $p = -\frac{1}{20}$ $-\frac{1}{20}(y+2) = (x+6)^2$

b) $V(3, -1)$ $D: x = \frac{11}{4}$
 $4p = \frac{11}{4} - 3 = \frac{11}{4} - \frac{12}{4} = -\frac{1}{4}$ $p = -\frac{1}{16}$
 $x-3 = (y+1)^2$

a) Focus: $(4, \frac{19}{4})$ Directrix $y = \frac{13}{4}$
Vertex: $(4, \frac{16}{4})$
 $p = \frac{3}{4}$
Opens: up
 $4p = 3$
 $3(y-4) = (x-4)^2$

a) Focus: $(\frac{-201}{20}, -9)$ Directrix $x = \frac{-199}{20}$
Vertex: $(\frac{-200}{20}, -9)$ $(-10, -9)$
 $p = \frac{1}{20}$
 $4p = \frac{1}{5}$
Opens: left
 $-\frac{1}{5}(x+10) = (y+9)^2$

- ★
- 1) Which way does the parabola open?
 - 2) Find p
 - 3) Find $4p$
 - 4) Plug into form
(need $4p$ & vertex)
- ★