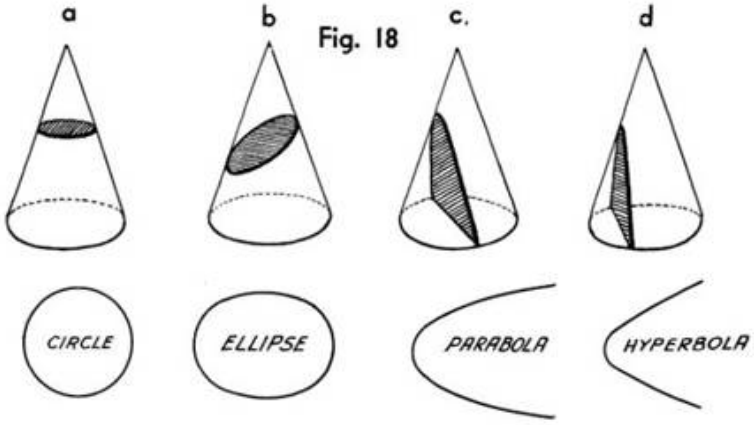
Chapter 9: Conic Sections

Definition: A conic section is the intersection of a plane and a right circular cone.



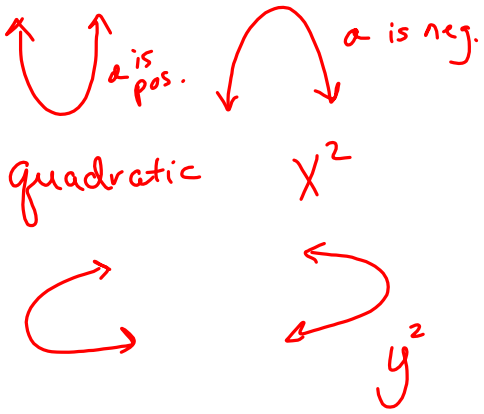
https://youtu.be/ky5Q6hEtjKk

9.1 Parabolas

TODAY

- You will write the standard form of the equation of a parabola given the vertex, focus and/or directrix
- You will identify the vertex, focus and directrix of a parabola given the equation in standard form
- You will graph the parabola given the vertex, focus and/or directrix

What do we already know?



Vertex
max/min
axis of
sym

$y = ax^2 + bx + c$

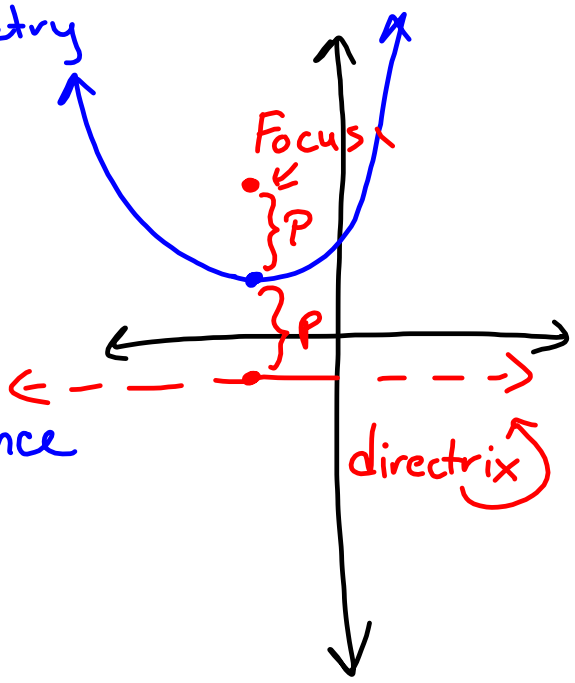
$y = a(x-h)^2 + k$

(h,k) vertex

$x = h$ axis of symmetry

Vertical Axis of Symmetry

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



(h,k) vertex

p is the distance to the focus

focus is inside

EX1: Find the vertex, focus, and directrix of the parabola

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

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

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

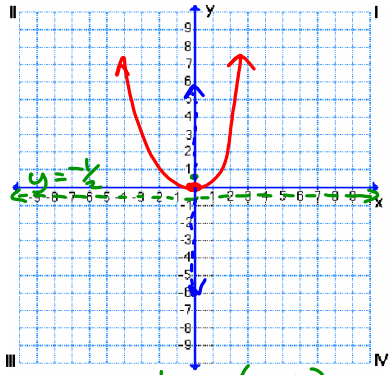
$x^2 = 2y$

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

$4p = 2$

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

$(x-0)^2 = 4\left(\frac{1}{2}\right)(y-0)$



Vertex: $(0,0)$

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

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

aos: $x = 0$

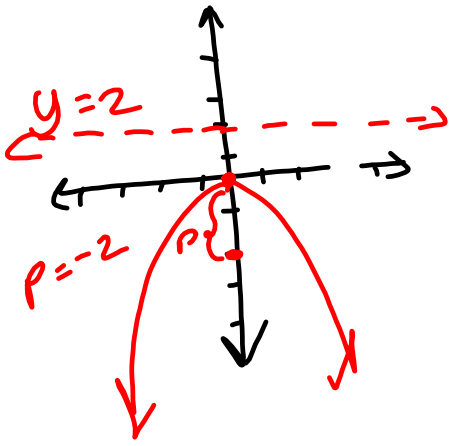
direction: up

EX2: Find the standard form of the equation of the parabola with vertex of $(0,0)$ and focus at $(0,-2)$

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

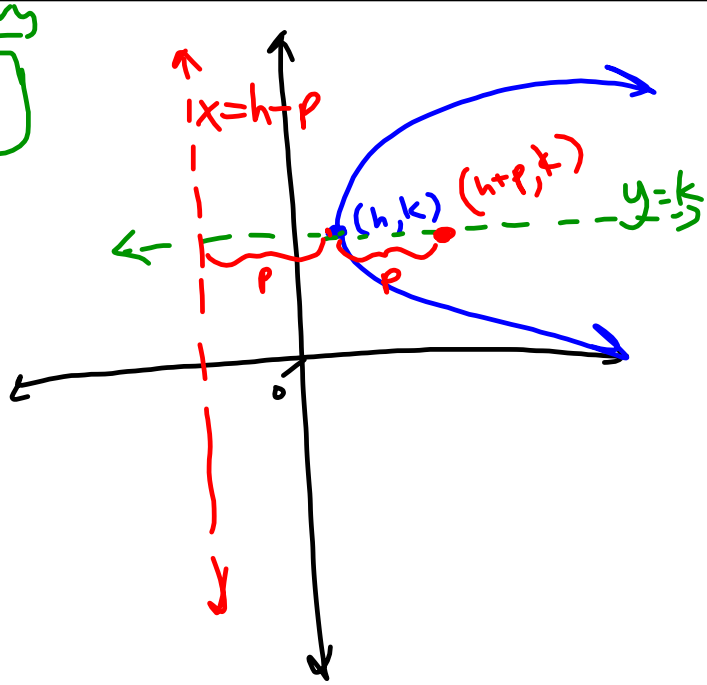
$x^2 = 4(-2)y$

$x^2 = -8y$



Horizontal Axis of Symmetry

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



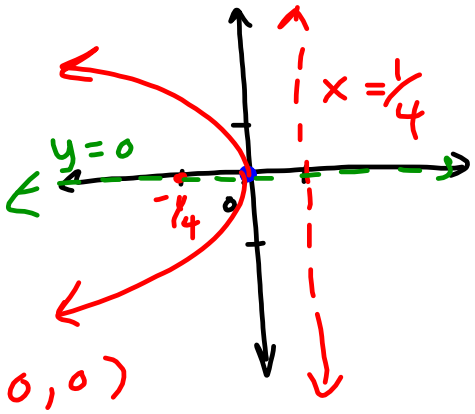
HW #2 $(y-k)^2 = 4p(x-h)$

$-x = y^2$

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

$-1 = 4p$

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



Vertex $(0,0)$

Focus $(-\frac{1}{4}, 0)$

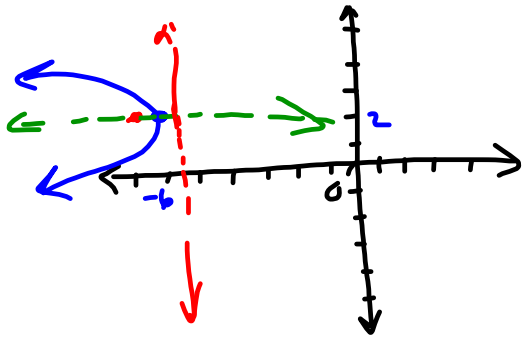
Directrix $x = \frac{1}{4}$

#5 $-\frac{1}{2}(x+6)=(y-2)^2$

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

$4p=-\frac{1}{2}$

$p=-\frac{1}{8}$



VERTEX $(-6,2)$

FOCUS $(-6\frac{1}{8},2)$

Directrix: $x=-5\frac{7}{8}$

AOS: $y=2$

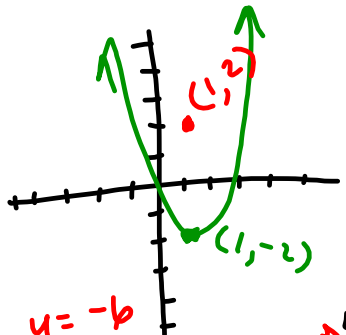
Opens: left

Ex3 Find the vertex, focus & directrix of

$x^2-2x-16y-31=0$ ← need to complete the square

needs to be in the form $(x-h)^2=4p(y-k)$

$x^2-2x=16y+31$ ← x's on one side, y's on the other



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

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

$(x-1)^2=16(y+2)$ ← GCF

$y=-6$ a.o.s. $\rightarrow 4p=16$

$p=4$

vertex: $(1,-2)$

focus: $(1,2)$

directrix: $y=-6$