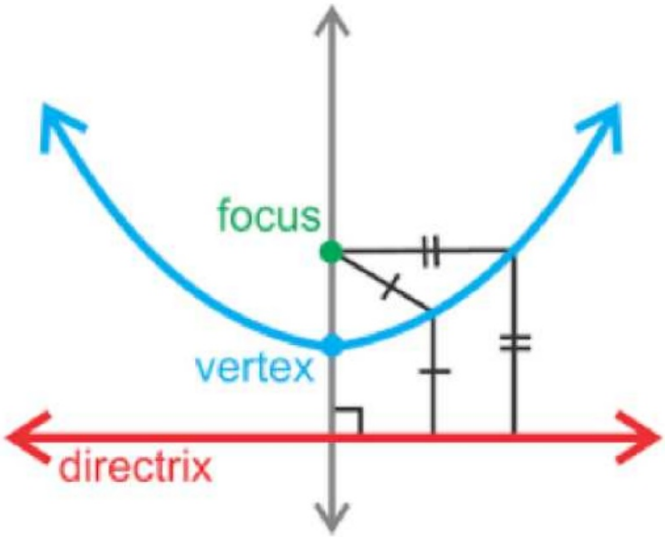
8.2 Parabolas

<u>parabola</u> - locus of points equidistant from a focus and directrix

HW Day 5
Pg. 531:3,9,15,16
Pg. 549: 12, 16,17



*The focus and directrix are not the actual graph. They are "graphing aids" that define the points on the parabola.

Standard Form

Opens: UP/DOWN

$$\boxed{(x-h)^2 = 4p(y-k)}$$

Opens: RIGHT/LEFT

$$\boxed{(y-k)^2 = 4p(x-h)}$$

Where:

vertex: (h, k)

p>0: opens up or right (positive)

p<0: opens down or left (negative

$|p|$: distance from vertex to focus and vertex to directrix

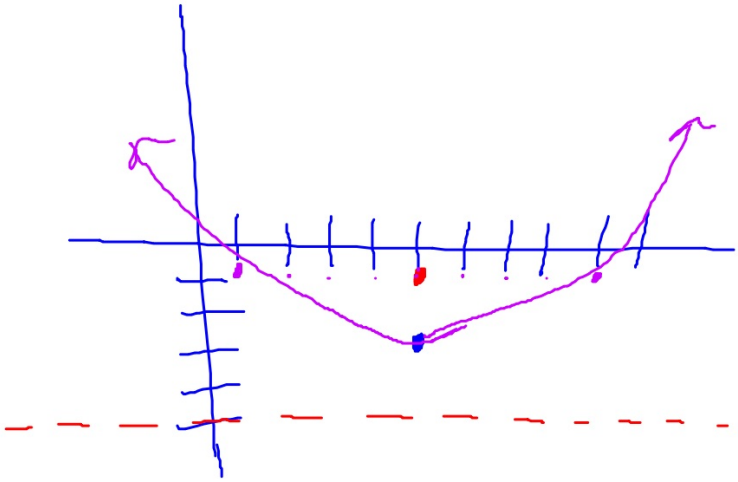
ex: Sketch & state the vertex, focus and directrix.

a) $(x-5)^2 = \overset{4p}{8}(y+3)$

V : $(5, -3)$

F : $(5, -1)$

Dir : $y = -5$



Latus Rectum (LR): a segment $|4p|$ units long through the focus of the parabola

$4p = 8$

$p = 2$

$LR = 8$

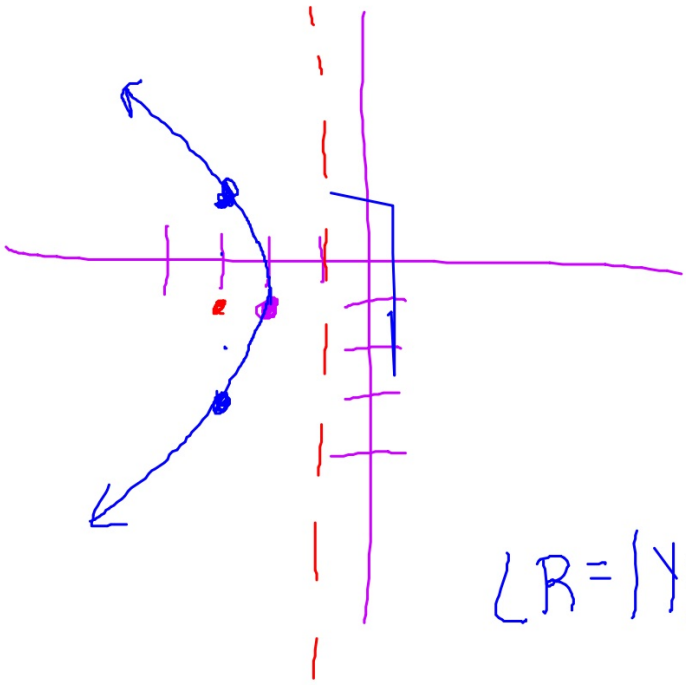
ex: Sketch & state the vertex, focus and directrix.

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

V : $(-2, -1)$

F : $(-3, -1)$

Dir : $x = -1$



$4p = -4$

$p = -1$

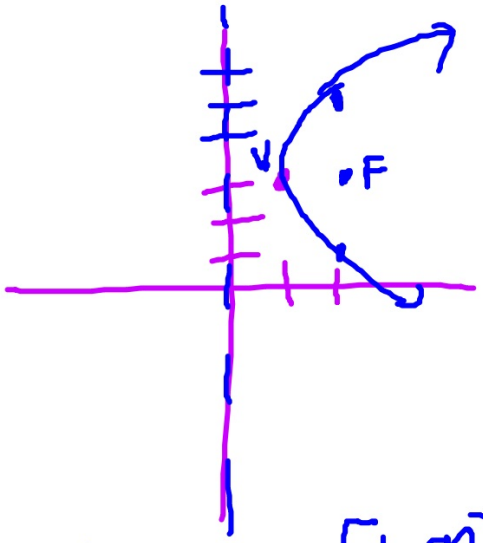
$LR = 4$

$LR = |4p|$

ex: Sketch & state the vertex, focus and directrix.

c)

$$(y-3)^2 = 4(x-1)$$



$V: (1, 3)$

$F: (2, 3)$

$4p = 4$

$p = 1$

Dir: $x = 0$

$LR = 4$

D: $[1, \infty)$

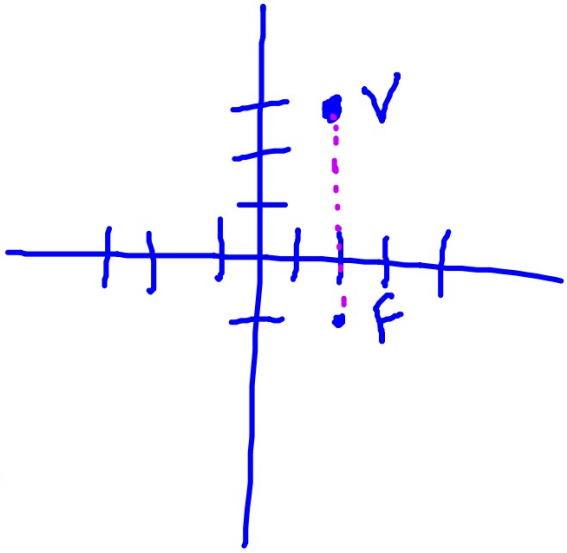
R: $(-\infty, \infty)$

ex: Write an equation in standard form of the parabola with the given characteristics.

a)

vertex: (2, 3) $\leftarrow$ $p=-4$

focus: (2, -1)



faces down

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

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

$$(x-2)^2 = -16(y-3)$$

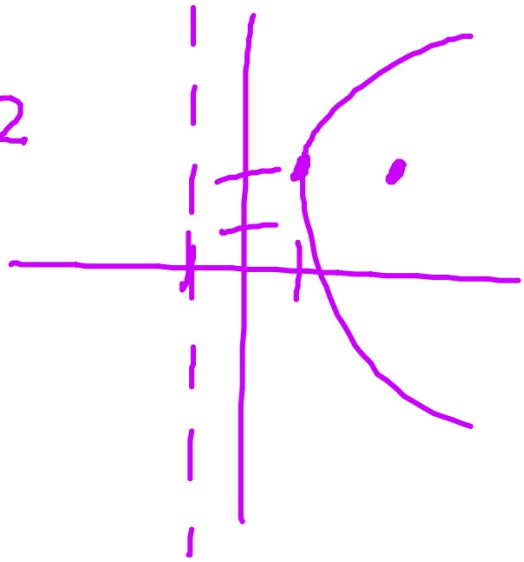
ex: Write an equation in standard form of the parabola with the given characteristics.

b)

vertex: (1, 2)
directrix: x=-1

4p, but p=2

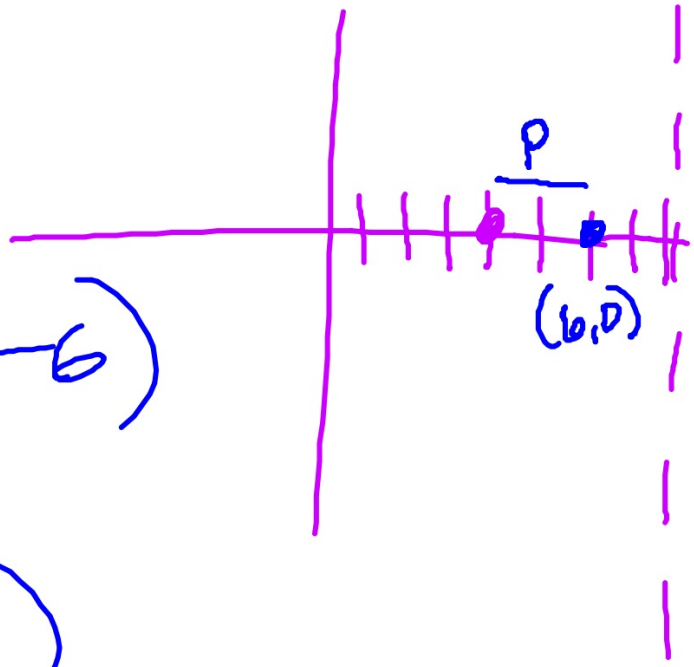
$$(y-2)^2 = 8(x-1)$$



ex: Write an equation in standard form of the parabola with the given characteristics.

c)

focus: (4, 0)
directrix: x=8



$$(y-0)^2=-8(x-6)$$

or

$$y^2=-8(x-6)$$