Lesson 83 Objective: SWBAT write and graph equations of parabolas.

Kickoff

1) Put in center-radius form and identify the center and radius.

$x^2 + y^2 + 14x - 12y + 4 = 0$

$x^2 + 14x + y^2 - 12y + 4 = 0$
$-4 \quad -4$
$(x^2 + 14x)(y^2 - 12y) = -4 + 49 + 36$
$(x+7)^2 + (y-6)^2 = 81$
$r = \sqrt{81} = 9$ Center $(-7, 6)$

① $(x+9)^2 + (y-16)^2 = 9$

$x^2 + y^2 + 18x - 32x + 328 = 0$

② $(x - 7\sqrt{3})^2 + (y-11)^2 = 33$

$x^2 + y^2 - 14\sqrt{3}x - 22y + 235 = 0$

Name: _____ Date: _____

Graph's and Equations of Parabolas

For a given point, called the **focus** and a given line not through the focus, called the **directrix**, a **parabola** is the locus of points such that the distance to the focus equals the distance to the directrix.

Unique Characteristics to Parabolas:

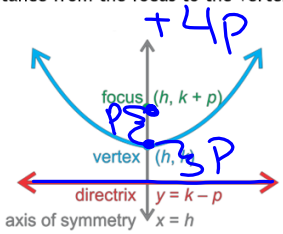
- Has a focus, p units from the vertex of the parabola. The Focus is always inside the opening of the parabola.
- P is the distance from the vertex to the focus or the distance from the vertex to the directrix
- The Vertex is always equidistant (in the middle of) between focus and the directrix
- Parabolas always open away from the directrix

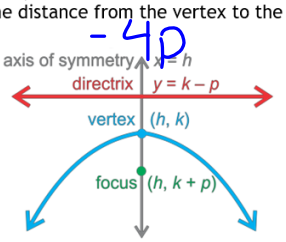
Parabola with Horizontal Directrix

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

Center = (h,k)

P is the distance from the focus to the vertex or the distance from the vertex to the directrix.



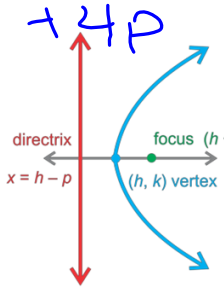


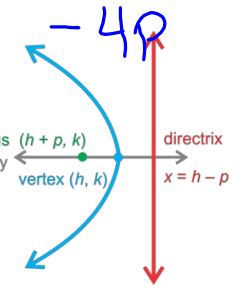
Parabola with Vertical Directrix

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

Center = (h,k)

P is the distance from the focus to the vertex or the distance from the vertex to the directrix.





1) $(x-4)^2 = 8(y-2)$

h

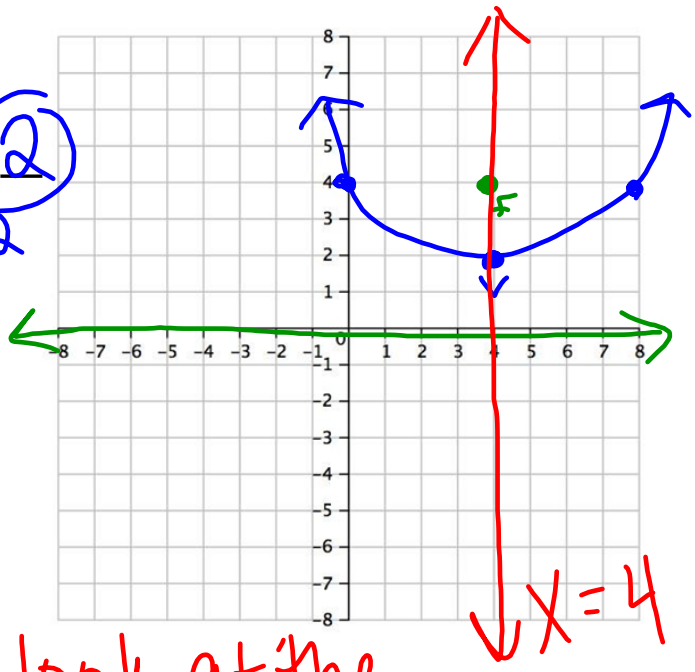
Vertex: (4, 2)

Opening Direction: ↑ p-value: 2

Focus (4, 4)

Equation of the Directrix: y = 0

x2



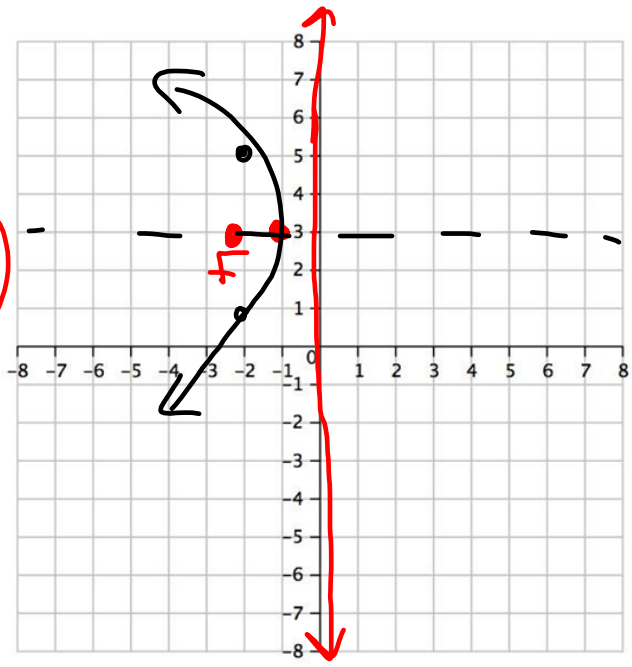
$\frac{4p}{4} = \frac{8}{4}$

$p = 2$

LOS $x = 4$ * look at the Squared value.

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

Vertex (-1, 3)



$4p = -4$

$p = -1$

Focus (-2, 3)

Directrix $x = 0$

LOS $y = 3$

Parabola with Horizontal Directrix	Parabola with Vertical Directrix
$(x-h)^2 = \pm 4p(y-k)$ Center = (h,k) P is the distance from the focus to the vertex or the distance from the vertex to the directrix.	$(y-k)^2 = \pm 4p(x-h)$ Center = (h,k) P is the distance from the focus to the vertex or the distance from the vertex to the directrix.

Complete the Square!

Write Equation in Standard Form, given Equation in General Form:

1) $y = x^2 - 12x + 41$

$-41 \quad -41$

$y - 41 = x^2 - 12x$

$+36$

$y - 5 = (x-6)^2$

$1(y-5) = (x-6)^2$

Vertex: (6,5)
Direction of Opening: ↑
P-value: 1/4

$4p = 1$

$p = 1/4$ Focus $(6, 5\frac{1}{4})$ Directrix $y = 4.75$

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

$+10 \quad +10$

$x + 10 = -y^2 - 4y$

-1

$-x - 10 = y^2 + 4y$

$+4$

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

$-1(x+6) = (y+2)^2$

Vertex: (-6,-2)
Direction of Opening: ←
P-value: -1/4

Focus $(-6\frac{1}{4}, -2)$ directrix $x = -5.75$

Write Equation in Standard form given parts

To write the equation of a Parabola in standard form we need

- The Vertex
- The p value
- Direction of Opening- Tells us + or -

Sketch it!

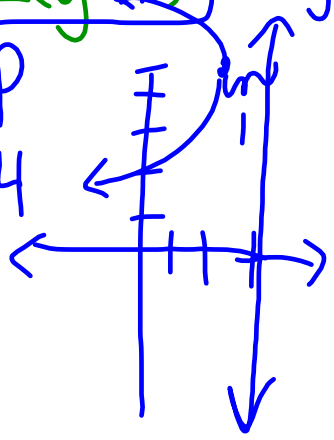
1) Vertex (2,1), Focus (2,5)

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

$4p$

4.4

2) Vertex (2, 5), Directrix x = 2/3



$(y-5)^2 = -4(x-2)$