Conics: Circles and Parabolas

Saturday, March 10, 2012
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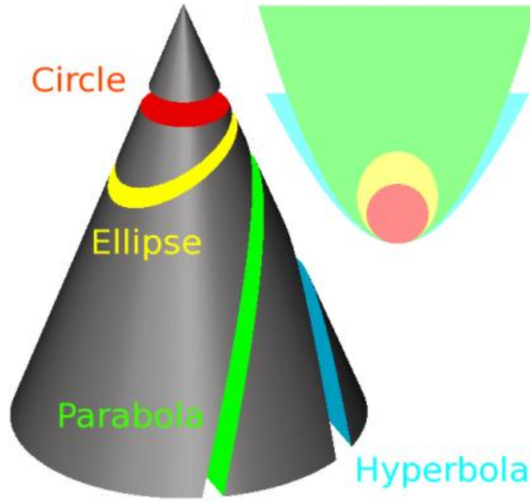


Circles

<u>Standard form of a circle</u>: $(x-h)^2+(y-k)^2=r^2$

(h, k) = Center   r = radius

Convert to standard form: $x^2+y^2+2x+6y+9=0$

Method: Completing the Square

Step 1: Arrange x, y, and constant terms according to the general form: $x^2+2x+\_\_\_\_+y^2+6y\_\_\_\_\_=-9$

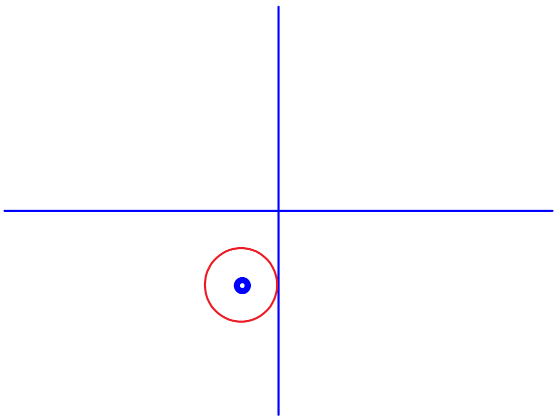
Step 2: Complete the square using: $\left(\frac{b}{2}\right)^2$

$x^2+2x+1+y^2+6y+9=-9+1+9$

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

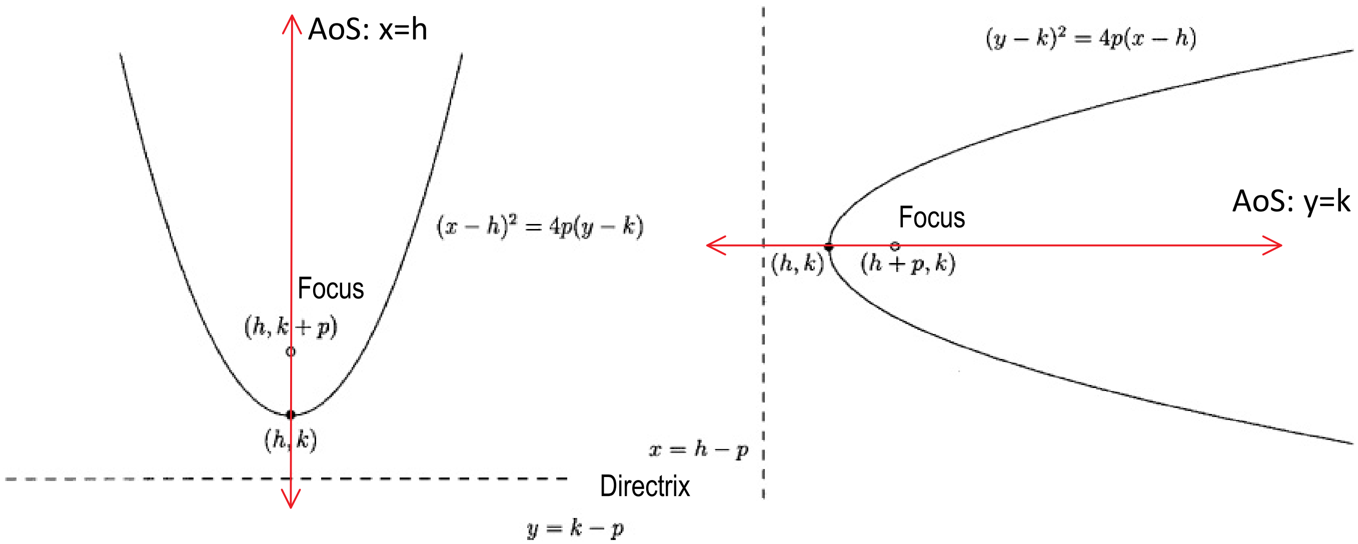
Center: (-1, -3) and radius: 1

Step 3: Graph



<u>General Form of a Parabola</u>: $(x-h)^2=4p(y-k)$ *or* $(y-k)^2=4p(x-h)$

Note: The square portion indicates what the axis of symmetry follows.



Convert to standard form and graph the parabola:

$$x^2 - 4x + 2y - 8 = 0$$

Step 1: Arrange terms like general form:

$$x^2 - 4x = -2y + 8$$

Step 2: Complete the square remember $\left(\frac{b}{2}\right)^2$.

$$x^2 - 4x + 4 = -2y + 8 + 4$$
$$(x-2)^2 = -2y + 12$$
$$(x-2)^2 = -2(y-6)$$

Note: Becareful to factor out so the the coefficient of x and y are both 1. This is how we find p.

Step 3: Graph.

a) We need (h, k) and p in order to graph correctly.
b) **Vertex: (2, 6)** 4p = -2 so p = $-\frac{1}{2}$ **AoS** (x = h): **x=2**
c) Because p is negative we know that the graph opens down.
d) **Directrix**: y=k-p so y=6 - (-1/2) = 6.5 **y=6.5**
e) **Focus**: (h, k+p)= (2, 6+(-1/2)) = **(2, 5.5)**