Intro to Conic Sections

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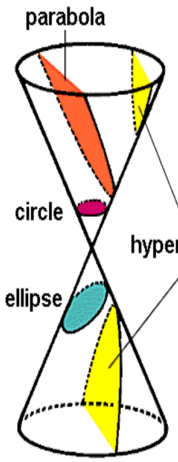
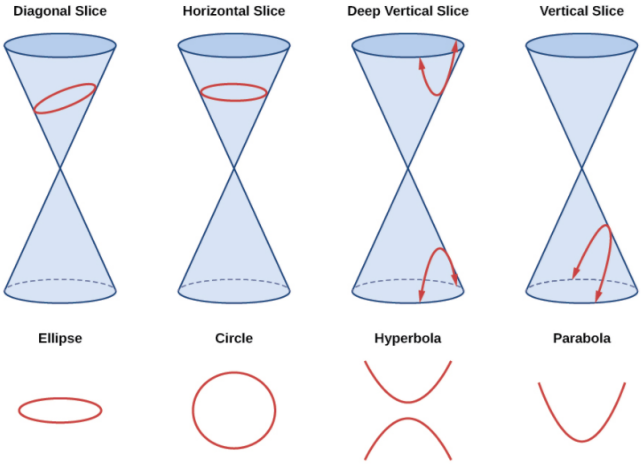
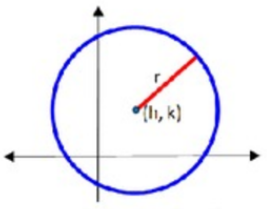


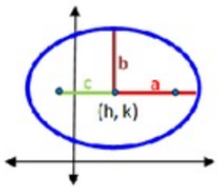
Conic Sections

A conic section is formed by the intersection of a plane with a right circular cone. The "kind" of curve produced is determined by the angle at which the plane intersects the surface.

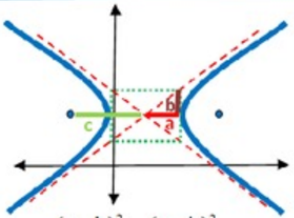




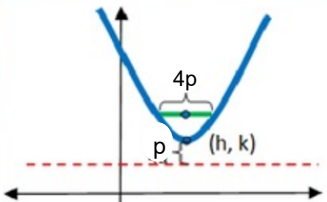
$(x-h)^2 + (y-k)^2 = r^2$



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



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



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

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Circles

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$(x-h)^2+(y-k)^2=r^2$ *where* (h,k) *is the center & r is the radius*

→ opposite sign of what you see in the equation

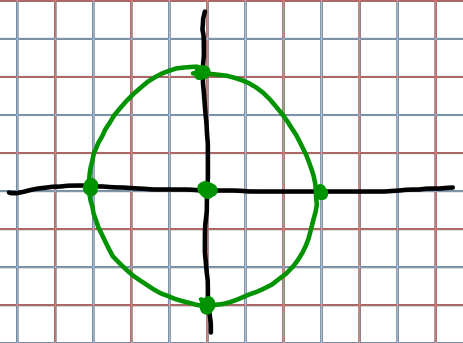
Graph

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

$(x-0)^2+(y-0)^2=9$ (h, k, r^2)

center (0,0)

radius: $r^2=9$, $r=3$



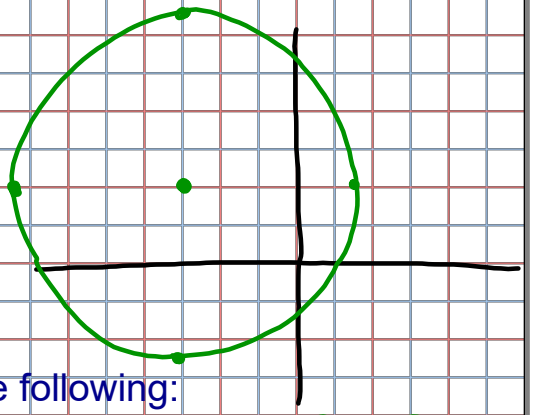
2. $(x+3)^2 + (y-2)^2 = 20$ (h, k, r^2)

center (-3, 2)

radius: $\sqrt{r^2}=\sqrt{20}$, $r=\sqrt{20}\approx 4.5$

$\sqrt{4}=4$, $\sqrt{5}=5$

20 = 2 · 10 = 2 · 2 · 5, $r=2\sqrt{5}$



Write the equation of the circle given the following:

1. center: (-6, 2) & radius: $3\sqrt{2}$ (h, k, r)

- plug in h, k, & r: $(x-h)^2+(y-k)^2=r^2$, $(x--6)^2+(y-2)^2=(3\sqrt{2})^2$
- simplify: $(3\sqrt{2})^2$, $3^2\sqrt{2}^2$, $9\cdot 2$, $(x+6)^2+(y-2)^2=18$

2. center: (4, -3) & a point on the circle: (-1, 3) (h, k; x, y)

- find radius using formula: $(x-h)^2+(y-k)^2=r^2$

$(-1-4)^2+(3--3)^2=r^2$

$(-5)^2+(6)^2=r^2$

$25+36=r^2$

$61=r^2$ or $\sqrt{61}=r$

- write eq. using (h, k) & r^2: $(x-4)^2+(y+3)^2=61$ (h, k, r^2)

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To rewrite an equation to standard form, you must complete the square.

- move the constant (c) to the other side & group x's & y's
- complete the square $(^b/_2)^2$ & add to both sides
- factor to a binomial squared $(x \pm {}^b/_2)^2$

Write in standard form. Then state center & radius.

1. $x^2 + y^2 - 8x - 6y + 21 = 0$

$(x^2 - 8x \underline{+16}) + (y^2 - 6y \underline{+9}) = -21 \underline{+16} \underline{+9}$

$(\frac{b}{2})^2$ $(\frac{-8}{2})^2 = (-4)^2$ $(-6/2)^2 = (-3)^2$

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

$\sqrt{r^2} = \sqrt{4}$

$r = 2$

ctr: $(4, 3)$ $r = 2$

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

LC LC

$(2x^2 - 4x \_\_) + (2y^2 + 12y \_\_) = 12 \_\_ \_\_$

* must factor out leading coefficients before $(\frac{b}{2})^2$

$2(x^2 - 2x \underline{+1}) + 2(y^2 + 6y \underline{+9}) = 12 \underline{+2} \underline{+18}$

$(-2/2)^2 = (-1)^2$ $(6/2)^2 = (3)^2$

$\frac{2(x-1)^2}{2} + \frac{2(y+3)^2}{2} = \frac{32}{2}$

* divide by LC

$(x-1)^2 + (y+3)^2 = 16$

ctr: $(1, -3)$ $r = 4$

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