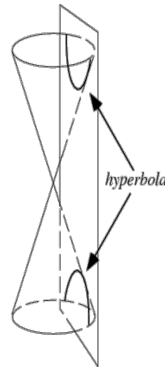
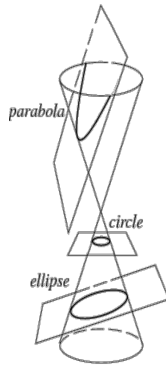


Lesson 9.0 -
Circles &
Completing the Square (review)



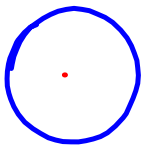
Conic Sections

A conic section is the set of all points formed by the intersection of a plane and a double-napped cone.

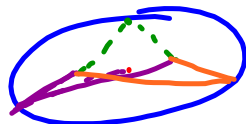


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circle



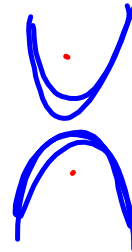
ellipse



parabola



hyperbola



Conic Equations

$$x^2 - 4x + 4 + y^2 - 2y + 1 = 17$$

$$3x^2 + 4y^2 - 8y + 4 = 12$$

Conic sections are loci (the plural of locus). A locus is the set of all points that satisfy a given relation. A locus may be a function, but conic sections are not.

CONIC EQUATIONS

$$x^2 - 4x + 4 + y^2 - 2y + 1 = 17$$



$$(x-2)^2 + (y-1)^2 = 17$$

Standard eq. of a circle

$$3x^2 + 4y^2 - 8y + 4 = 12$$



$$\frac{x^2}{4} + \frac{(y-1)^2}{3} = 1$$

Standard eq. of an ellipse

How do we do it??

Let's review "HOW TO COMPLETE THE SQUARE"

If $x^2+bx=c$, then

$$x^2 + bx + \left(\frac{b}{2}\right)^2 = c + \left(\frac{b}{2}\right)^2$$

$$\left(x + \frac{b}{2}\right)^2 = c + \frac{b^2}{4}$$

$$\left(x + \frac{b}{2}\right)^2 - \left(c + \frac{b^2}{4}\right)$$

ex: $x^2 + \underline{6}x = 5$

$$x^2 + 6x + 3^2 = 5 + 3^2$$

$$(x + 3)^2 = 14$$

$$(x + 3)^2 - 14$$

* take half the middle term and square

Complete the square.

$$y^2 - 8y =$$

$$y^2 - 8y + 16 = 16$$

$$(y - 4)^2 = 16$$

Complete the square

$$a^2 - 5a =$$

$$a^2 - 5a + \frac{25}{4} = \frac{25}{4}$$

$$\left(a - \frac{5}{2}\right)^2 = \frac{25}{4}$$

TOYO: COMPLETE THE SQUARE

$$z^2 + 12z =$$

$$z^2 + 12z + 36 = 36$$

$$(z + 6)^2 = 36$$

Complete the square

$$4x^2 - 16x =$$

$$4(x^2 - 4x + 4) = 16$$

$$4(x-2)^2 = 16$$

Complete the square

$$3x^2 + 6x =$$

TOYO: Complete the square

$$7y^2 - 56y =$$

Complete the square

$$5z^2 - 35z =$$

Complete the square

$$-9y^2 + 18y =$$

Complete the square

$$x^2 + 3x - y^2 + 2y =$$

$$\left(x^2 + 3x + \frac{9}{4}\right) - \left(y^2 - 2y + 1\right) = \frac{9}{4} - 1$$

$$\left(x + \frac{3}{2}\right)^2 - (y - 1)^2 = \frac{5}{4}$$

Complete the square

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

Circles

A circle is the set of all points **equidistant** from a given point called the **center**.
(radius)

The center is the point on the interior of a circle that is **equidistant** from every point on the circle.

* center
* radius

The equation for a circle in standard form with center (h, k) and radius r is given by the equation:

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

Center: (h, k)

radius: r

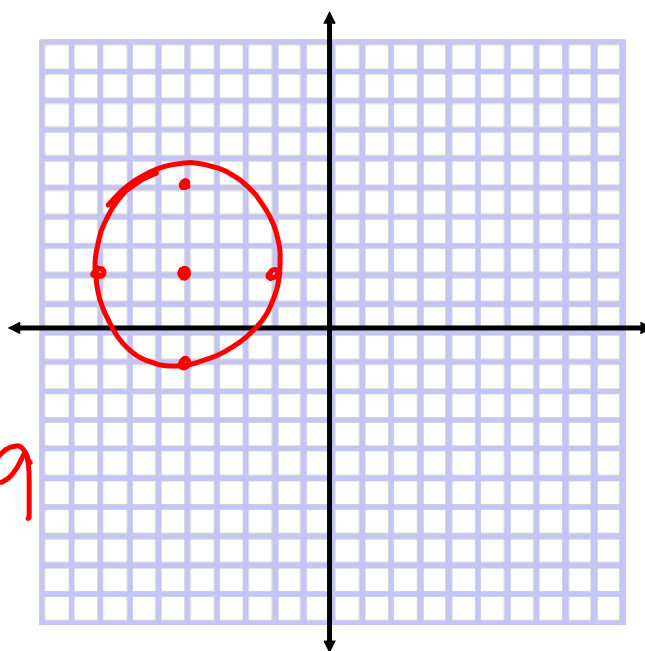
opposite

Graph the circle.

$$\text{center} = (-5, 2)$$

$$r = 3$$

$$(x+5)^2 + (y-2)^2 = 9$$



Graph the circle.

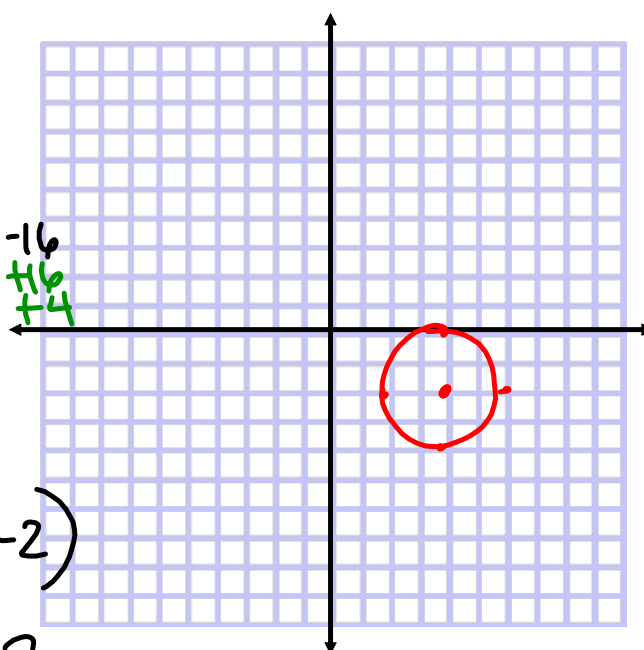
$$x^2 - 8x + y^2 + 4y = -16$$

$$(x^2 - 8x + 16) + (y^2 + 4y + 4) = -16$$

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

center: $(4, -2)$

radius: 2



Graph the circle

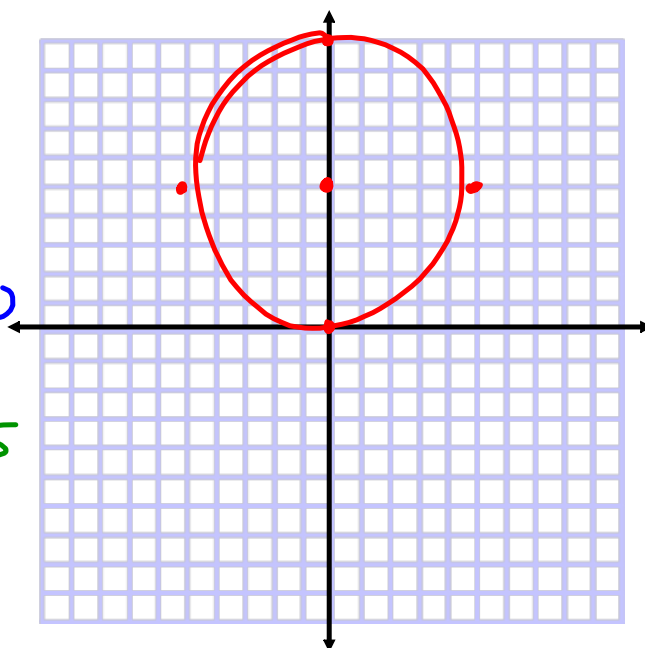
$$x^2 + y^2 - 10y = 0$$

$$x^2 + (y^2 - 10y + 25) = 0$$

$$x^2 + (y - 5)^2 = 25$$

$$C: (0, 5)$$

$$r: 5$$



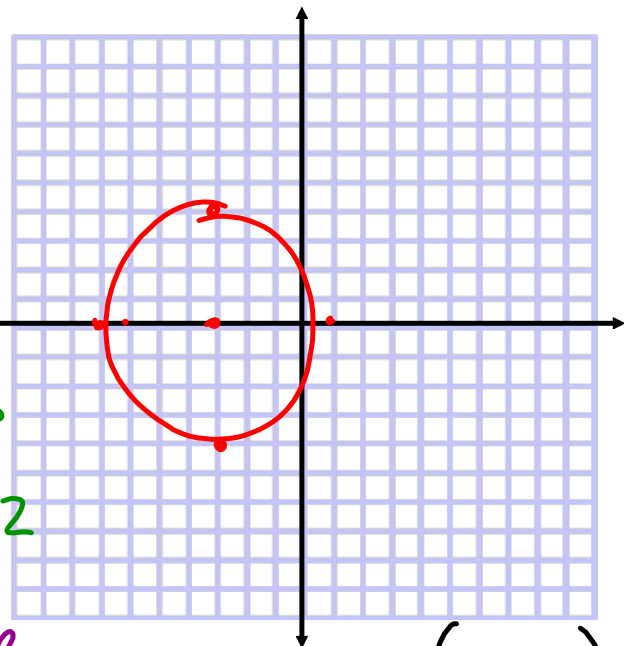
Graph the circle

$$2x^2 + 12x + 2y^2 = 14$$

$$2(x^2 + 6x + 9) + 2y^2 = 14$$

$$2(x + 3)^2 + 2y^2 = 32$$

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



center: $(-3, 0)$
radius: 4

a)

$$(x^2 + 26x + 169) + (y^2 + 28y + 196) = -364$$

$$(x + 13)^2 + (y + 14)^2 = 1$$

$$C: (-13, -14)$$

$$r: 1$$