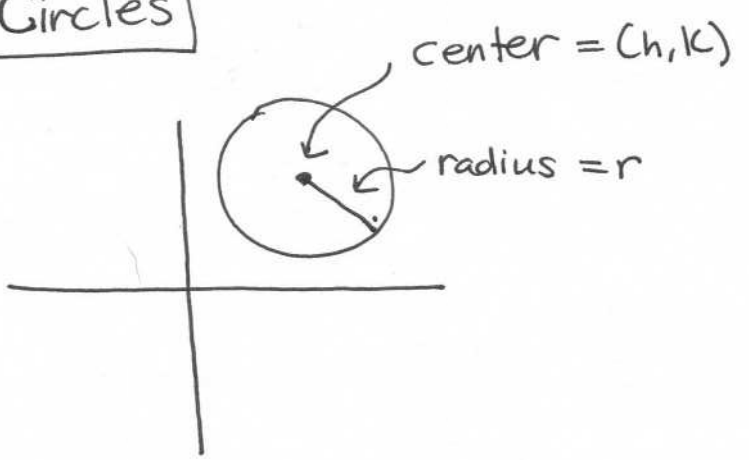
# Circles



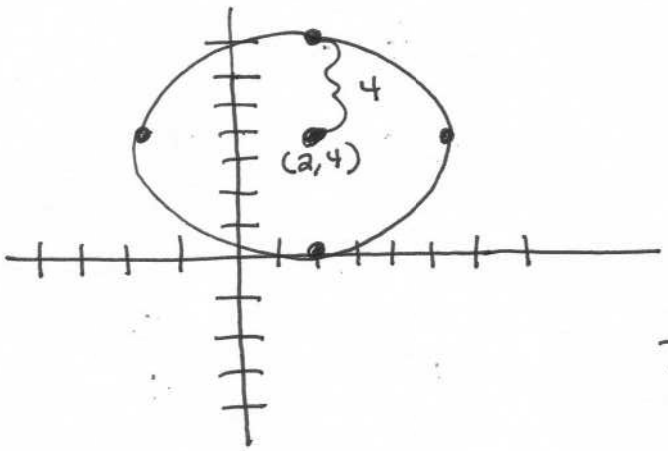

Standard form: $(x-h)^2+(y-k)^2=r^2$

general form: $x^2+y^2+ax+by+c=0$

## To Graph a circle

you need to know 1) center
2) radius

Example: Sketch a graph of a circle with radius 4 and center (2, 4).




① plot the center
② extend from the center the distance of the radius up, down, left and right.

The result should look like a circle.

NOTE: To graph circles of the TI 83 or 84, you must graph 2 equations and adjust the setting of the window to zoom square.

## Reading the center from standard form

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

Example: $(x-3)^2+(y+5)^2=36$

center $=\boxed{(3,-5)}$

radius $=\sqrt{36}=\boxed{6}$

## Reading the center from general form

If the equation of the circle is in general form ( $x^2+y^2+ax+by+c=0$ ), you must convert it to standard form ( $(x-h)^2+(y-k)^2=r^2$ ) so you can read off the center & radius.

conversion tools: completing the square

Recall: completing the square $\Rightarrow$ add $\left(\frac{1}{2}(\text{middle coef.})\right)^2$

**Example** Find the center and radius of the circle

$x^2+y^2-6x+2y+9=0$

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

$x^2-6x+\square+y^2+2y+\square=-9+\square+\square$

$\left(\frac{-6}{2}\right)^2$ $\left(\frac{2}{2}\right)^2$

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

$\boxed{(x-3)^2+(y+1)^2=1}$ converted equation (standard)

$\boxed{\text{center}=(3,-1),\ \text{radius}=1}$

**To find the x & y intercepts of a circle on a graph**

x-intercepts $\Rightarrow$ set $y=0$
y-intercepts $\Rightarrow$ set $x=0$

**Example** $(x+4)^2 + (y-2)^2 = 9$

**x-intercepts** let $y=0$

$$(x+4)^2 + (0-2)^2 = 9$$
$$(x+4)^2 + 4 = 9$$
$$(x+4)^2 = 5$$
$$x+4 = \pm\sqrt{5}$$
$$x = -4 \pm \sqrt{5}$$
$$x \approx -1.76 \text{ \& } -6.23$$
$$\Rightarrow (-1.76, 0) \quad (-6.23, 0)$$

**y-intercepts** let $x=0$

$$(0+4)^2 + (y-2)^2 = 9$$
$$16 + (y-2)^2 = 9$$
$$(y-2)^2 = -7$$
$$y-2 = \pm\sqrt{-7}$$
$$y = 2 \pm i\sqrt{7}$$

$\Rightarrow$ no y-intercepts since $2 \pm i\sqrt{7}$ is imaginary.

**Graph:** center $= (-4, 2)$
radius $= 3$