

## Sect. 10-1: The Circle

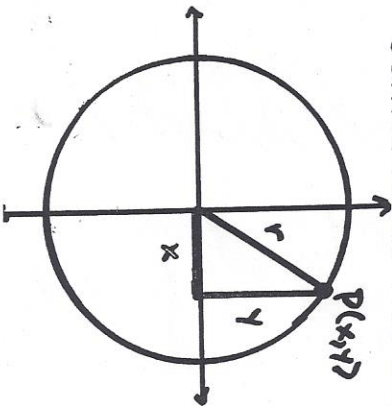
A locus is a set of points, and only those points, that satisfy a given set of conditions.

A circle is the locus of all points in a plane at a given distance from a fixed point on the plane called the center.

The distance from the center to any point on the circle is called the radius of the circle.

Circles that have the same center, but not necessarily the same radius, are called concentric circles.

Here is the parent graph, centered at the origin.

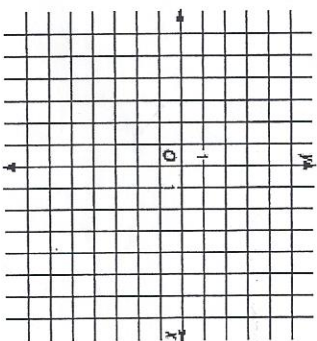


Use the Pythagorean Theorem to write the basic equation:

## Standard Form of the Equation of a Circle:

$(x - h)^2 + (y - k)^2 = r^2$  for a circle with radius  $r$  and center  $(h,k)$ .

**Example:** Write the equation of the circle with its center at  $(4, -1)$  and a radius of 6 units. Then graph the equation.



## General Form of the Equation of a Circle:

$x^2 + y^2 + Dx + Ey + F = 0$  where  $D$ ,  $E$ , and  $F$  are constants.

What do you notice about the terms in the general form of the equation?

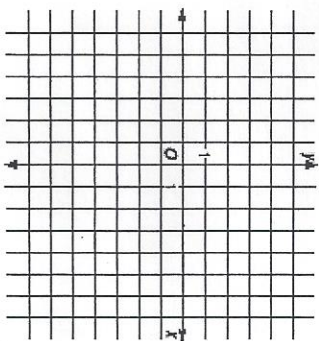
If an equation is given in general form, you must rewrite it in standard form first.

**Example:** The equation of a circle is

$$4x^2 + 4y^2 - 24x + 16y + 51 = 0.$$

Find the radius and coordinates of the center.

Then graph the equation.



\*If you know the coordinates of the center and a point on the circle, then you can use the distance formula to find the radius.

\*If you know the coordinates of the endpoints of a diameter of the circle, then you can use the midpoint formula to find the coordinates of the center and the distance formula to find the length of the diameter.

**Example:** Write the equation of the circle with endpoints of a diameter at  $(-3, 4)$  and  $(2, 1)$ .