Section 2.4

Circles

DEFINITION OF A CIRCLE

A **circle** is a set of points in the xy-plane that are a fixed distance r from a fixed point (h, k). The fixed distance r is called the **radius**, and the fixed point (h, k) is called the **center** of the circle.

STANDARD FORM OF AN EQUATION OF A CIRCLE

The **standard form of an equation of a circle** with radius r and center (h, k) is

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

CIRCLES WITH CENTER AT THE ORIGIN

Theorem: The standard form of an equation of a circle of radius r with center at the origin $(0,0)$ is

$$x^2 + y^2 = r^2$$

Definition: If the radius $r = 1$, the circle whose center is at the origin is called the **unit circle** and has equation

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

GENERAL FORM OF THE EQUATION OF A CIRCLE

When its graph is a circle, the equation

$$x^2 + y^2 + ax + by + c = 0$$

is referred to as the **general form of the equation of a circle**.

WRITING AN EQUATION OF A CIRCLE IN STANDARD FROM

To write the equation of a circle in standard form:

1. Collect all variable terms on the left side of the equation and all constant terms on the right side.

2. Group the "x"-terms together and the "y"-terms together.

3. Complete the square for both x- and y-terms.

4. Write x- and y-terms as the perfect squares of bionomals.