

NOTES: MATH 2 HONORS

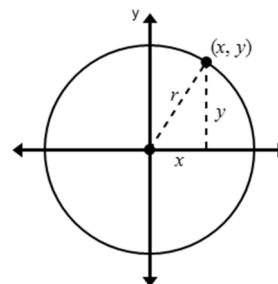
Unit 10: Equations of Circles

A circle is the set of all points equidistant from a given point called the center. In order to derive the equation of a circle, we need to find the distance from the center to any point (x, y) on the circle. This distance is the length of the radius. We can derive the equation of a circle using the distance formula or the Pythagorean Theorem.

Create a right triangle with the radius as the hypotenuse, the length x as the horizontal leg, and the length y as the vertical leg.

Using the Pythagorean Theorem to relate the sides of the right triangle, we get the standard form of the **equation of a circle centered at the point (h, k)** , where r is the radius:

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



Example 1: Given the standard form of a circle, determine the center and the radius of the circle.

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

2. $(x - 1)^2 + (y - 7)^2 = 25$

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

Example 2: Write the standard form of a circle with the given characteristics.

1. A circle with radius 10 and centered at $(8, -6)$.

2. A circle with radius 5 and centered at $(-4, 3)$.

3. A circle with endpoints of a diameter at $(9, 2)$ and $(-1, 6)$.

4. A circle with endpoints of a diameter at $(3, 4)$ and $(-5, 2)$.

Example 3: Find the center and radius of the circle described by the following equations..

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

2. $4x^2 + 4y^2 + 20x - 40y + 116 = 0$

Example 4: A particular cell phone tower is designed to service a 12-mile radius. The tower is located at $(-3,5)$ on a coordinate plane whose units represent miles. What is the standard equation of the outer boundary of the region serviced by the tower? Is a cell phone user at $(8,0)$ within the service range? Explain.