

# The Circle

- ◆ Find the distance and midpoint given two points.
- ◆ Graph a circle in standard form.
- ◆ Write the equation of a circle in standard form.
- ◆ Write the equation of a circle in standard form given a graph.

# The Distance Formula

◆ The distance  $d$  between the points  $(x_1, y_1)$  and  $(x_2, y_2)$  is as follows:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

# The Midpoint Formula

- ◆ The midpoint of the line segment joining  $A(x_1, y_1)$  and  $B(x_2, y_2)$  is as follows:

$$MP = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

- ◆ Each coordinate of M is the mean of the corresponding coordinates of A and B.

# Find the Distance and Midpoint

1.  $(8, -4)$  and  $(5, -2)$

$$d = \sqrt{13} \quad MP = \left( \frac{13}{2}, -3 \right)$$

2.  $(3, -1)$  and  $(-5, -2)$

$$d = \sqrt{65} \quad MP = \left( -1, -\frac{3}{2} \right)$$

# Standard Form of a Circle

- ◆ The standard form of the equation of a circle with center at  $(h, k)$  and radius  $r$  is as follows:

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

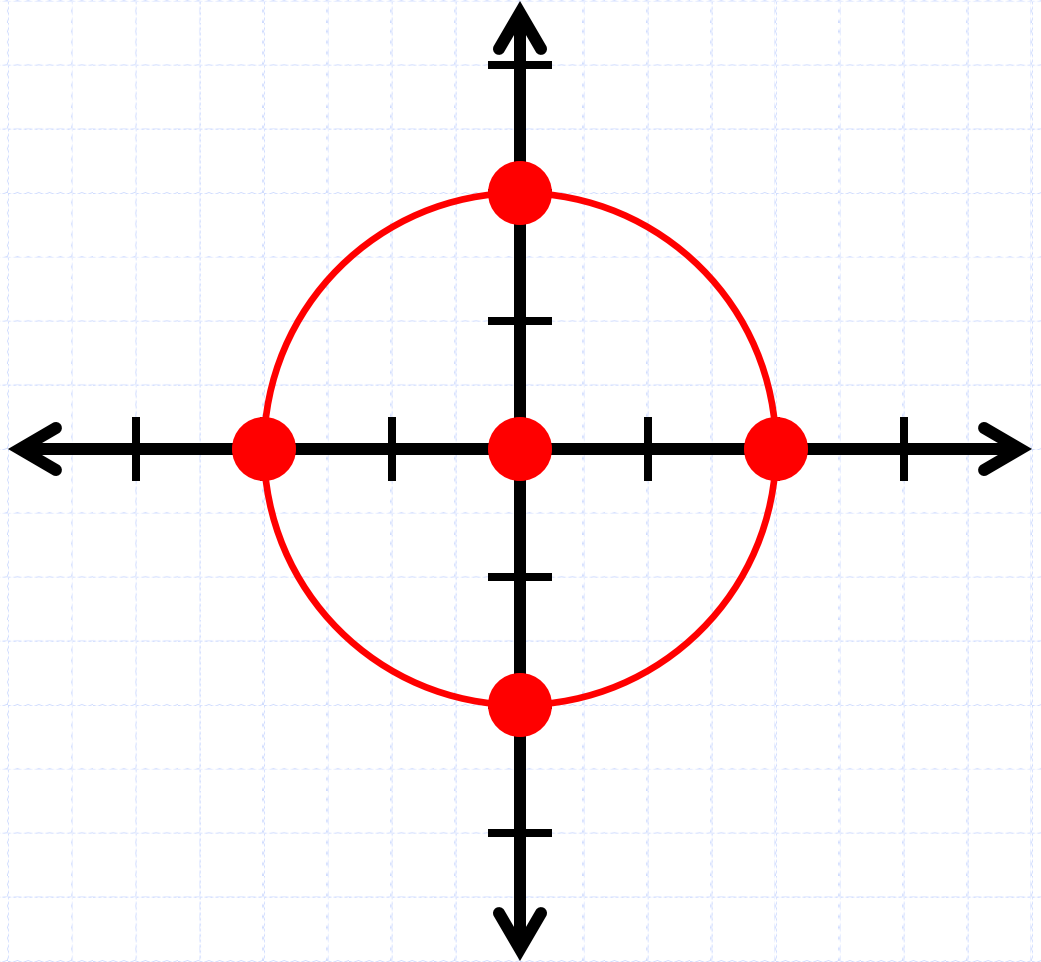
## #3 Graph

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

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

$$C = (0, 0)$$

$$r = 2$$

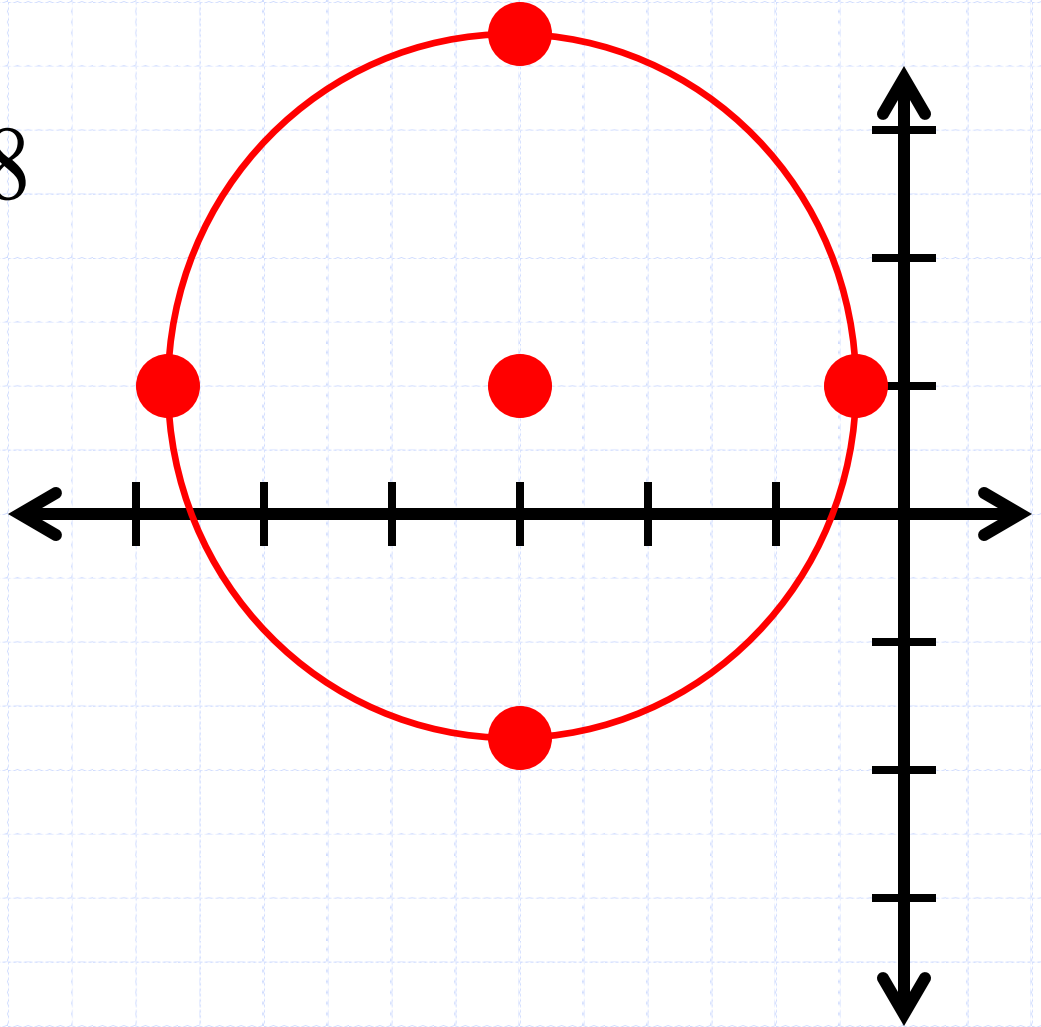


## #4 Graph

$$(x+3)^2 + (y-1)^2 = 8$$

$$C = (-3, 1)$$

$$r = 2.8$$



# #5

◆  $(2, -1)$  is on a circle centered at the point  $(-1, -2)$ . Write the equation of the circle.

**Find the distance:**

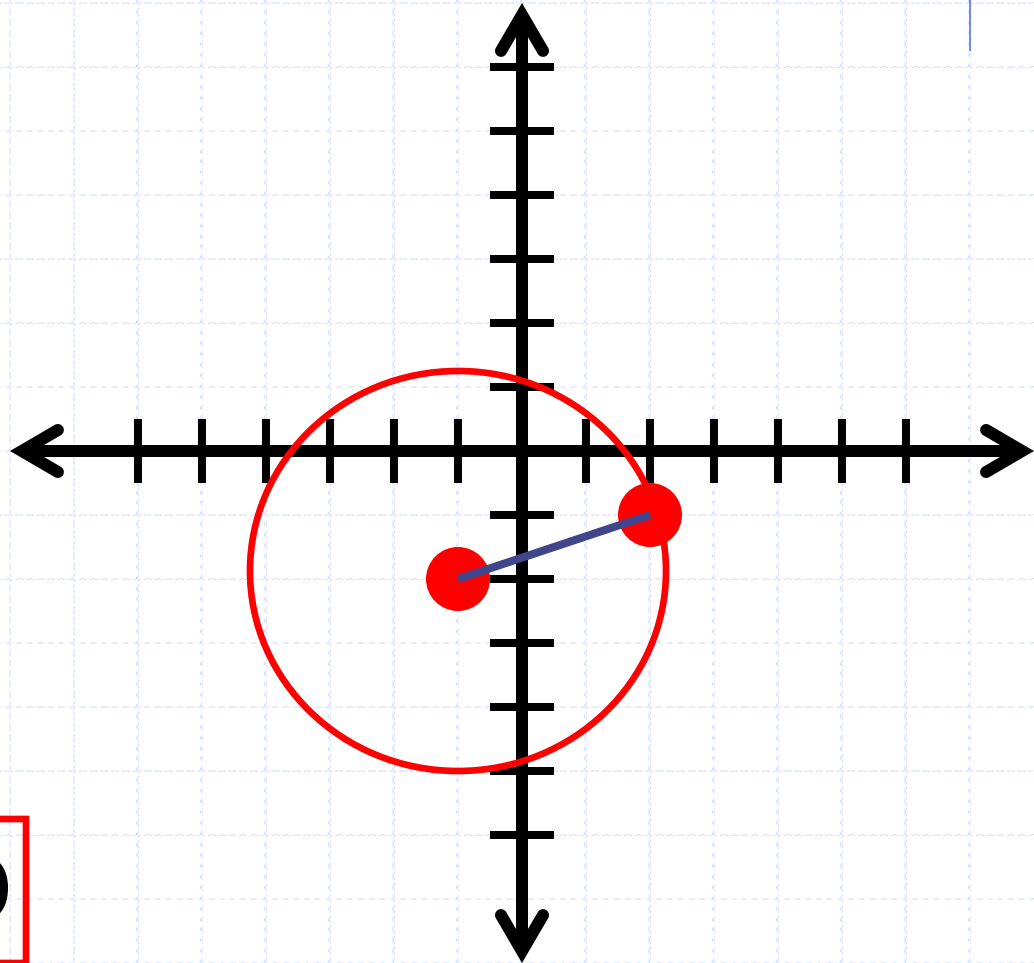
$(2, -1)$  and  $(-1, -2)$

$$r = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

$$r = \sqrt{(2 + 1)^2 + (-1 + 2)^2}$$

$$r = \sqrt{10}$$

$$(x + 1)^2 + (y + 2)^2 = 10$$





# #6

◆  $(5, 1)$  is on a circle centered at the point  $(1, 3)$ . Write the equation of the circle.

**Find the distance:**

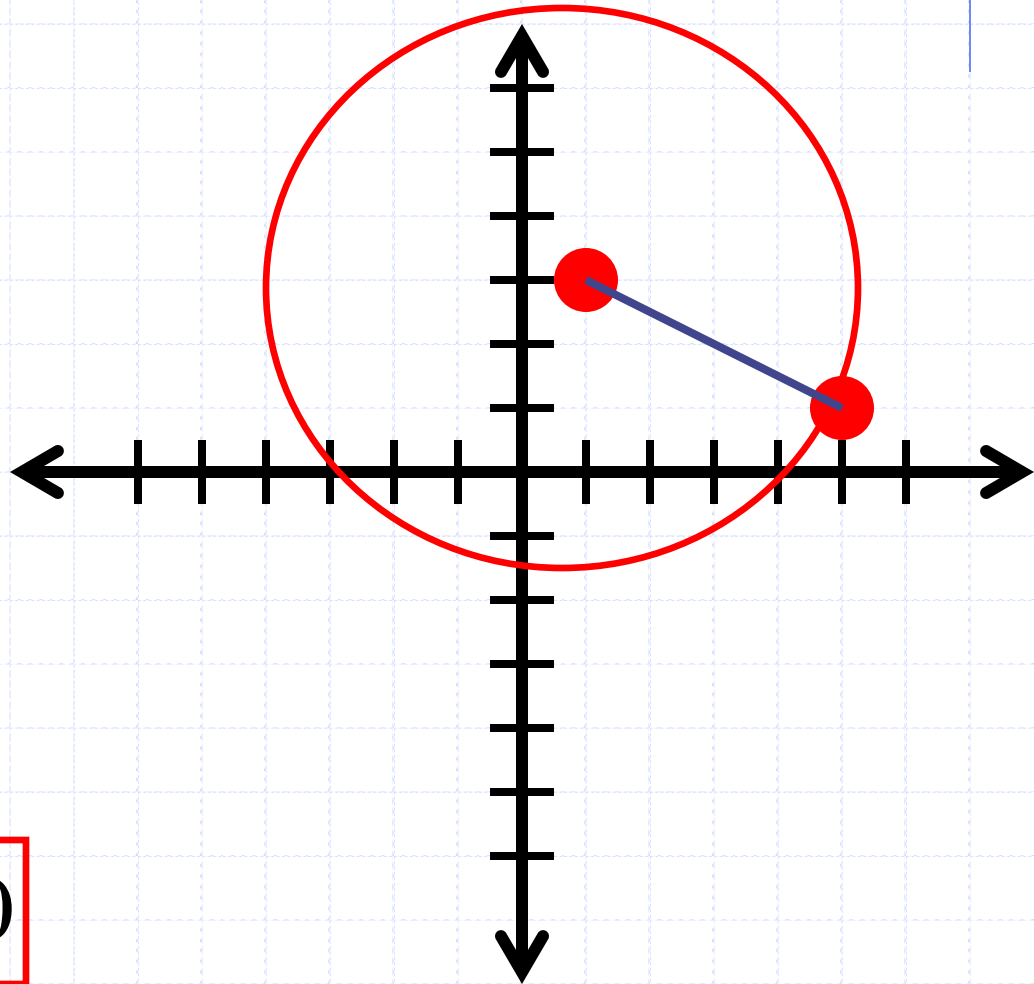
$(5, 1)$  and  $(1, 3)$

$$r = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

$$r = \sqrt{(5 - 1)^2 + (1 - 3)^2}$$

$$r = \sqrt{20}$$

$$(x - 1)^2 + (y - 3)^2 = 20$$



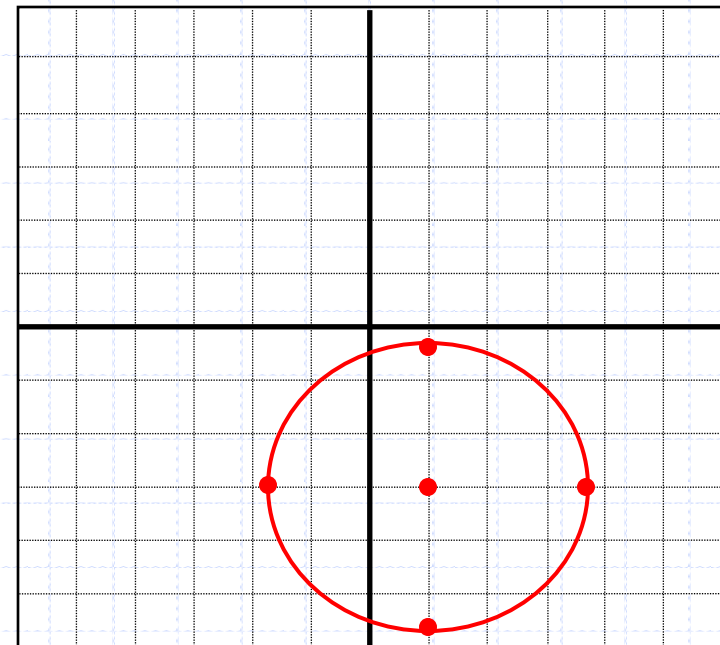
# Writing a Circle in Standard Form

$$7. x^2 + y^2 - 2x + 6y + 3 = 0$$

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

$$x^2 - 2x + \underline{1} + y^2 + 6y + \underline{9} = -3 + \underline{1} + \underline{9}$$

$$(x-1)^2 + (y+3)^2 = 7$$



# Writing a Circle in Standard Form

8.  $x^2 + y^2 + 4x - 8y - 5 = 0$

$$x^2 + 4x + y^2 - 8y = 5$$

$$x^2 + 4x + \underline{4} + y^2 - 8y + \underline{16} = 5 + \underline{4} + \underline{16}$$

$$(x + 2)^2 + (y - 4)^2 = 25$$

