Today's Lesson

Find the standard form of a circle with the given endpoints of a diameter.

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

You need two things to write the equation of a circle:
1. the center (h,k)
2. the radius r^2

Example 1: Endpoints (-1,6) and (9,0)

The center is just the midpoint of the endpoints of the diameter

$$\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)=\left(\frac{-1+9}{2},\frac{6+0}{2}\right)=(\overset{h}{4},\overset{k}{3})$$

midpoint formula

Now, put your center into the standard form equation above:

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

Because the endpoints are on the circle, they satisfy the equation (that means they "work" in the equation of that circle. We can now substitute in one of the endpoints for x and y and get our value of r squared.

Let's use the endpoint (-1,6) to substitute in for x and y

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

$$(-1-4)^2+(6-3)^2=r^2$$

$$(-5)^2+(3)^2=r^2$$

$$25+9=r^2$$

$$34=r^2$$

STOP HERE! That's what you need.

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

$$\boxed{(x-4)^2+(y-3)^2=34}$$

① $\boxed{\overset{x}{3},\overset{y}{4}}$ and (5,6)

Find midpt $\left(\frac{3+5}{2}, \frac{4+6}{2}\right) = (\overset{h}{4}, \overset{k}{5})$

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

$(x-4)^2 + (y-5)^2 = r^2$

use (3,4) $(3-4)^2 + (4-5)^2 = r^2$

$1 + 1 = r^2$

$2 = r^2$

put into eq

$$\boxed{(x-4)^2 + (y-5)^2 = 2}$$

⑤ $\frac{4x^2}{4} + \frac{4y^2}{4} - \frac{16x}{4} - \frac{24y}{4} + \frac{36}{4} = \frac{0}{4}$

$x^2 + y^2 - 4x - 6y + 9 = 0$
$\quad\quad -9 \quad -9$

$x^2 - 4x + \underline{4} + y^2 - 6y + \underline{9} = -9 + \underline{4} + \underline{9}$

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

Center (2,3) $r = \sqrt{4} = 2$