

Find the center and radius for the circle with equation

$$x^2 + y^2 + 4x - 8y + 11 = 0$$

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To "complete the square" in x and in y, first rearrange the terms.

$$x^2 + 4x + y^2 - 8y + 11 = 0$$

$$x^2 + 4x + (\quad) + y^2 - 8y + (\quad) = -11 \quad \text{Note: } x^2 + bx + \left(\frac{b^2}{4}\right) = \left(x + \frac{b}{2}\right)^2$$

Now add the same numbers to both sides.

$$x^2 + 4x + 4 + y^2 - 8y + 16 = -11 + 4 + 16$$

$$(x+2)^2 + (y-4)^2 = 9$$

- We now see that the center is $(-2, 4)$ and the radius is 3.