Completing the Square with Circles

Complete the square to rewrite the equation of a circle in standard form, and then give the center and radius.

Example:

$x^2 + y^2 + 6x + 4y - 12 = 0$

$(x^2 + 6x \qquad) + (y^2 + 4y \qquad) = 12$

$\left(x^2 + 6x + \left(\frac{6}{2}\right)^2\right) + \left(y^2 + 4y + \left(\frac{4}{2}\right)^2\right) = 12 + \left(\frac{6}{2}\right)^2 + \left(\frac{4}{2}\right)^2$

$(x^2 + 6x + 9) + (y^2 + 4y + 4) = 12 + 9 + 4$

$(x + 3)^2 + (y + 2)^2 = 25$

- Original Equation
- Rearrange the terms grouping the x terms together, the y terms together and moving the constant term to the right hand side (RHS).
- In each parenthesis, take ½ the linear term and square it. Add to both the RHS and the LHS of the equation.
- Factor the parenthesis and combine like terms (RHS)

Center (-3, -2) Radius is 5

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

Center: _____   Radius: _____

2. $x^2 - 6x + y^2 + 10y - 15 = 0$

Center: _____   Radius: _____

3. $x^2 + y^2 - 4x - 12y + 15 = 0$

Center: _____   Radius: _____

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

Center: _____   Radius: _____

5. $0 = x^2 + 6x + y^2 - 2y - 10$

Center: _____   Radius: _____

6. $x^2 + y^2 + 16y + 28 = 0$

Center: _____   Radius: _____

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

Center: _____   Radius: _____

8. $x^2 + 5x + y^2 - 3y = \frac{1}{2}$

Center: _____   Radius: _____