Completing the Square with Circles

1. What is the center and radius of the circle with the following equations:

1. $x^2 + y^2 + 6x - 8y = 0$

$x^2 + 6x + \boxed{9} + y^2 - 8y + \boxed{16} = 0 + \boxed{9} + \boxed{16}$

$(x+3)^2 + (y-4)^2 = 25$

$(-3, 4) \quad r = 5$

2. $x^2 + y^2 + 10x - 4y - 6 = 1$

$\underset{+6 \;+6}{}$

$x^2 + 10x + \boxed{25} + y^2 - 4y + \boxed{4} = 7 + \boxed{25} + \boxed{4}$

$(x+5)^2 + (y-2)^2 = 36$

$(-5, 2) \quad r = 6$

3. $x^2 + y^2 + 16x + 6y + 9 = 0$

$x^2 + 16x + \boxed{64} + y^2 + 6y + \boxed{9} = -9 + \boxed{64} + \boxed{9}$

$(x+8)^2 + (y+3)^2 = 64$

$(-8, -3) \quad r = 8$

4. $x^2 + y^2 - 12x - 14y = 15$

$x^2 - 12x + \boxed{36} + y^2 - 14y + \boxed{49} = 15 + \boxed{36} + \boxed{49}$

$(x-6)(x-6) + (y-7)(y-7) = 100$

$(x-6)^2 + (y-7)^2 = 100$

$(6, 7) \quad r = 10$

5. $x^2 + 8y + 10 + y^2 - 4x = 6$

$\underset{-10 \qquad\quad -10}{}$

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

$(x-2)(x-2)^2 + (y+4)(y+4) = 16$

$(x-2)^2 + (y+4)^2 = 16$

$(2, -4) \quad r = 4$

6. $x^2 + 4x + 12 + y^2 - 2y - 1 = 22$

$\underset{-12 \qquad +1 \;\; -12+1}{}$

$x^2 + 4x + \boxed{4} + y^2 - 2y + \boxed{1} = 11 + \boxed{4} + \boxed{1}$

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

$(-2, 1) \quad r = 4$

7. $y^2 + 6x + x^2 - 12y + 2 = 11$

$\underset{-2 \;\; -2}{}$

$x^2 + 6x + \boxed{9} + y^2 - 12y + \boxed{36} = 9 + 9 + 36$

$(x+3)^2 + (y-6)^2 = 54$

$(-3, 6)$

$r = \sqrt{54}$

8. $x^2 + y^2 + 6x - 10y + 4 = -5$

$\underset{-4 \;\; -4}{}$

$x^2 + 6x + \boxed{9} + y^2 - 10y + \boxed{25} = -9 + 9 + 25$

$(x+3)^2 + (y-5)^2 = 25$

$(-3, 5)$

$r = 5$

8. What are the coordinates of the center of a circle whose equation is
$x^2 + y^2 - 16x + 6y + 53 = 0$?
1) $(-8,-3)$
2) $(-8,3)$
3) $(8,-3)$
4) $(8,3)$

$x^2 - 16x + \boxed{64} + y^2 + 6y + \boxed{9} = -53 + \boxed{64} + \boxed{9}$

$(x-8)^2 + (y+3)^2 = 20$

$(8,-3)$

9. The equation $x^2 + y^2 - 2x + 6y + 3 = 0$ is equivalent to
1) $(x-1)^2 + (y+3)^2 = -3$
2) $(x-1)^2 + (y+3)^2 = 7$
3) $(x+1)^2 + (y+3)^2 = 7$
4) $(x+1)^2 + (y+3)^2 = 10$

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

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

10. The equation of a circle is $x^2 + y^2 + 6y = 7$. What are the coordinates of the center and the length of the radius of the circle?
1) center $(0,3)$ and radius 4
2) center $(0,-3)$ and radius 4
3) center $(0,3)$ and radius 16
4) center $(0,-3)$ and radius 16

$x^2 + y^2 + 6y + \boxed{9} = 7 + \boxed{9}$

$x^2 + (y+3)^2 = 16$

$(0,-3)$ $r=4$

11. What are the coordinates of the center and length of the radius of the circle whose equation is $x^2 + 6x + y^2 - 4y = 23$?
1) $(3,-2)$ and 36
2) $(3,-2)$ and 6
3) $(-3,2)$ and 36
4) $(-3,2)$ and 6

$x^2 + 6x + \boxed{9} + y^2 - 4y + \boxed{4} = 23 + \boxed{9} + \boxed{4}$

$(x+3)^2 + (y-2)^2 = 36$

$(-3,2)$ $r=6$

12. If $x^2 + 4x + y^2 - 6y - 12 = 0$ is the equation of a circle, the length of the radius is
1) 25
2) 16
3) 5
4) 4

$x^2 + 4x + \boxed{4} + y^2 - 6y + \boxed{9} = 12 + \boxed{4} + \boxed{9}$

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