#11 Find the center and radius of the circle represented by each equation

a. $x^2 + y^2 - 8y = 9$

$x^2 + y^2 - 8y + 16 = 9 + 16$

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

C: $(0, 4)$

$r = 5$

b. $(x+7)^2 + y^2 + 6y = 27$

$(x+7)^2 + y^2 + 6y + 9 = 27 + 9$

$(x+7)^2 + (y+3)^2 = 36$

C: $(-7, -3)$

$r : 6$

c. $x^2 + 10x + y^2 - 12y = -10$

$x^2 + 10x + 25 + y^2 - 12y + 36 = -10 + 25 + 36$

$(x+5)^2 + (y-6)^2 = 51$

C: $(-5, 6)$

$r : \sqrt{51}$

d. $x^2 + y^2 = 8x - 14y + 35$

$x^2 - 8x + y^2 + 14y = 35$

$x^2 - 8x + 16 + y^2 + 14y + 49 = 35 + 16 + 49$

$(x-4)^2 + (y+7)^2 = 100$

C: $(4, -7)$

$R . 10$

#12 Find the solution set

a. $\begin{cases} x^2 + y^2 = 25 \\ x = 3 \end{cases}$

$(3)^2 + y^2 = 25$
$9 + y^2 = 25$
$y^2 = 16$
$y = \pm 4$

$\boxed{\begin{array}{l}(3,4) \\ (3,-4)\end{array}}$

b $\begin{cases} x^2 + y^2 = 25 \\ \underline{x^2 - y^2 = 7} \end{cases}$

$2x^2 = 32$
$x^2 = 16$
$x = \pm 4$

$(-4)^2 + y^2 = 25$
$16 + y^2 = 25$
$y^2 = 9$
$y = \pm 3$

$\boxed{\begin{array}{l}(-4,3) \\ (-4,-3)\end{array}}$

$(4)^2 + y^2 = 25$
$y = \pm 3$

$\boxed{\begin{array}{l}(4,-3) \\ (4,3)\end{array}}$

c. $\begin{cases} x^2 + y^2 = 34 \\ x + y = 8 \end{cases}$

$y = 8 - x$

$x^2 + (8-x)^2 = 34$
$x^2 + 64 - 16x + x^2 = 34$
$2x^2 - 16x + 30 = 6$
$2(x^2 - 8x + 15) = 0$
$2(x-3)(x-5) = 0$
$x = 3, 5$

when $x = 3$
$y = 8 - 3$
$y = 5$ $\boxed{(3,5)}$

when $x = 5$
$y = 8 - 5$ $\boxed{(5,3)}$
$y = 3$

d $\begin{cases} |y| = 6 \\ x^2 + y^2 = 100 \end{cases}$

$y = 6$
$y = -6$

when $y = 6$
$x^2 + (6)^2 = 100$
$x^2 + 36 = 100$
$x^2 = 64$
$x = \pm 8$

$\boxed{(8,6) \quad (-8,6)}$

$y = -6$
$x^2 + (-6)^2 = 100$
$x = \pm 8$

$\boxed{(-6,8) \quad (-6,-8)}$

#16 Find the center and radius of the graph of

$$3x^2 + 12x + 3y^2 - 5y = 2$$

make leading coefficients 1

$$x^2 + 4x + y^2 - \frac{5}{3}y = \frac{2}{3}$$

$$x^2 + 4x + 4 + y^2 - \frac{5}{3}y + \frac{25}{36} = \frac{2}{3} + 4 + \frac{25}{36}$$

$$(x+2)^2 + \left(y - \frac{5}{6}\right)^2 = \frac{193}{36}$$

$$C: \left(-2, \frac{5}{6}\right)$$

$$R = \frac{\sqrt{193}}{6}$$

#18 Find the equation of the path of the point that moves so that its distance from the point $(3,0)$ is always twice its distance from the point $(-3,0)$

Call the point (x,y)

$$\sqrt{(3-x)^2 + (y-0)^2} = 2\sqrt{(x+3)^2 + (y-0)^2}$$

$$\left(\sqrt{9-6x+x^2+y^2}\right)^2 = \left(2\sqrt{x^2+6x+9+y^2}\right)^2$$

$$9 - 6x + x^2 + y^2 = 4\left(x^2 + 6x + 9 + y^2\right)$$

$$9 - 6x + x^2 + y^2 = 4x^2 + 24x + 36 + 4y^2$$

$$0 = \frac{3x^2}{3} + \frac{30x}{3} + \frac{27}{3} + \frac{3y^2}{3}$$

$$0 = x^2 + 10x + 9 + y^2$$

$$25 = x^2 + 10x + 25 + y^2 + 9$$

$$16 = (x+5)^2 + y^2$$