

Put the equation in standard form. If it is a circle, tell the center and radius. If it is an ellipse, tell the center, vertices, co-vertices, and the coordinates of the foci. Sketch the graph.

1. $x^2 + 4x + y^2 = 0$

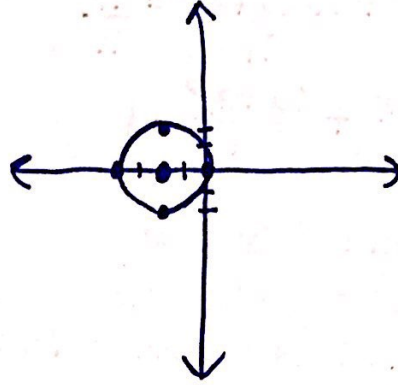
$(\frac{4}{2})^2$
 $(2)^2$
4

$$(x^2 + 4x + 4) + y^2 = 0 + 4$$

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

C: (-2, 0)

r = 2



2. $3x^2 + 3y^2 - 24x - 18y + 63 = 0$

$3x^2 - 24x + 3y^2 - 18y = -63$

$3(x^2 - 8x) + 3(y^2 - 6y) = -63$

$3(x^2 - 8x + 16) + 3(y^2 - 6y + 9) = -63 + 48 + 27$

$\frac{3(x-4)^2}{3} + \frac{3(y-3)^2}{3} = \frac{12}{3}$

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

3. $4x^2 + 4y^2 - 16x - 8y - 5 = 0$

$4x^2 - 16x + 4y^2 - 8y = 5$

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

$4(x^2 - 4x + 4) + 4(y^2 - 2y + 1) = 5 + 16 + 4$

$\frac{4(x-2)^2}{4} + \frac{4(y-1)^2}{4} = \frac{25}{4}$

$(x-2)^2 + (y-1)^2 = \frac{25}{4}$

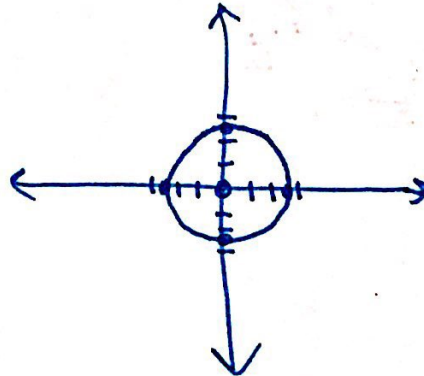
4. $5x^2 - 30 = -5y^2$

$\frac{5x^2}{5} + \frac{5y^2}{5} = \frac{30}{5}$

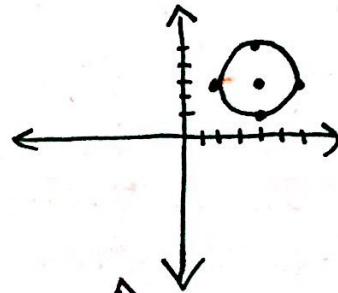
$x^2 + y^2 = 6$

Center: (0, 0)

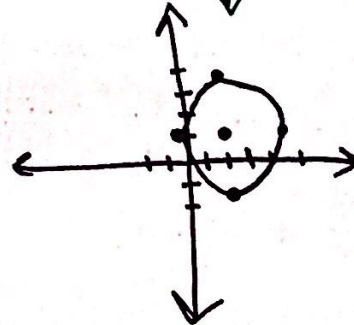
r = 2.45



Center: (4, 3)
r = 2



Center: (2, 1)
r = 5/2



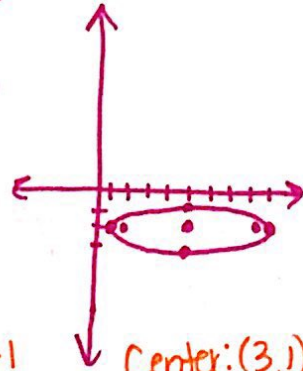
$$a^2 = 16 \quad b^2 = 1 \quad c^2 = a^2 - b^2$$

$$a = \pm 4 \quad b = \pm 1 \quad c^2 = 16 - 1$$

$$c^2 = 15$$

$$c = \pm 3.9$$

Center: (5, -2)
 V: (5 ± 4, -2)
 (9, -2) (1, -2)
 CV: (5, -2 ± 1)
 (5, -1) (5, -3)
 F: (5 ± 3.9, -2)
 (8.9, -2) (1.1, -2)



$$\left(-\frac{10}{2}\right)^2$$

$$(-5)^2$$

$$25$$

$$\left(\frac{4}{2}\right)^2$$

$$(2)^2$$

$$4$$

5. $x^2 + 16y^2 - 10x + 64y + 73 = 0$

$$x^2 - 10x + 16y^2 + 64y = -73$$

$$(x^2 - 10x) + 16(y^2 + 4y) = -73$$

$$(x^2 - 10x + 25) + 16(y^2 + 4y + 4) = -73 + 25 + 64$$

$$\frac{(x-5)^2}{16} + \frac{16(y+2)^2}{16} = \frac{16}{16}$$

$$\frac{(x-5)^2}{16} + \frac{(y+2)^2}{1} = 1$$

6. $9x^2 + y^2 - 54x - 2y = -73$

$$9x^2 - 54x + y^2 - 2y = -73$$

$$9(x^2 - 6x) + (y^2 - 2y) = -73$$

$$9(x^2 - 6x + 9) + (y^2 - 2y + 1) = -73 + 81 + 1$$

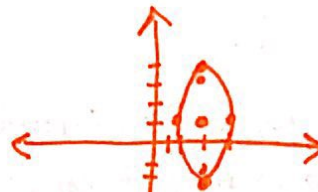
$$\frac{9(x-3)^2}{9} + \frac{(y-1)^2}{9} = \frac{9}{9}$$

$$\frac{(x-3)^2}{1} + \frac{(y-1)^2}{9} = 1$$

$$a^2 = 9 \quad b^2 = 1 \quad c^2 = 9 - 1$$

$$a = \pm 3 \quad b = \pm 1 \quad c^2 = 8$$

$$c = \pm 2.8$$



Center: (3, 1)
 V: (3, 4)
 (3, -2)
 CV: (4, 1)
 (2, 1)
 F: (3, 3.8)
 (3, -1.8)

7. $9x^2 + 16y^2 - 54x + 32y - 47 = 0$

$$9x^2 - 54x + 16y^2 + 32y = 47$$

$$9(x^2 - 6x) + 16(y^2 + 2y) = 47$$

$$9(x^2 - 6x + 9) + 16(y^2 + 2y + 1) = 47 + 81 + 16$$

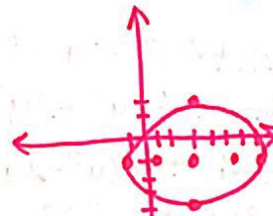
$$\frac{9(x-3)^2}{144} + \frac{16(y+1)^2}{144} = \frac{144}{144}$$

$$\frac{(x-3)^2}{16} + \frac{(y+1)^2}{9} = 1$$

$$a^2 = 16 \quad b^2 = 9 \quad c^2 = 16 - 9$$

$$a = \pm 4 \quad b = \pm 3 \quad c^2 = 7$$

$$c = \pm 2.6$$



C: (3, -1)
 V: (7, -1)
 (-1, -1)
 CV: (3, 2)
 (3, -4)
 F: (5.6, -1)
 (0.4, -1)

8. $3x^2 + 4y^2 - 24x - 16y = -52$

$$3x^2 - 24x + 4y^2 - 16y = -52$$

$$3(x^2 - 8x) + 4(y^2 - 4y) = -52$$

$$3(x^2 - 8x + 16) + 4(y^2 - 4y + 4) = -52 + 48 + 16$$

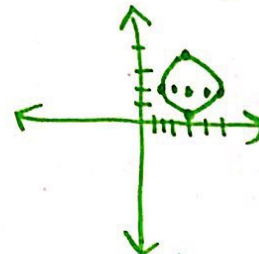
$$3\frac{(x-4)^2}{12} + 4\frac{(y-2)^2}{12} = \frac{12}{12}$$

$$\frac{(x-4)^2}{4} + \frac{(y-2)^2}{3} = 1$$

$$a^2 = 4 \quad b^2 = 3 \quad c^2 = 4 - 3$$

$$a = \pm 2 \quad b = \pm 1.7 \quad c^2 = 1$$

$$c = \pm 1$$



C: (4, 2)
 V: (6, 2)
 (2, 2)
 CV: (4, 3.7)
 (4, 0.3)
 F: (5, 2)
 (3, 2)

Tell if the graph of each equation is an ellipse, circle, parabola, or hyperbola.

9. $18x + 12y^2 - 144x - 48y = -120$ **Parabola**
 10. $5x^2 - 144x - 48y = -120 - 5y^2$ **Circle**

11. $5x^2 - 144x - 48y = -120 + 5y^2$ **Hyperbola**
 12. $6x^2 - 144x - 48y = -120 - 5y^2$ **Ellipse**