Ellipses – Writing Equations WS

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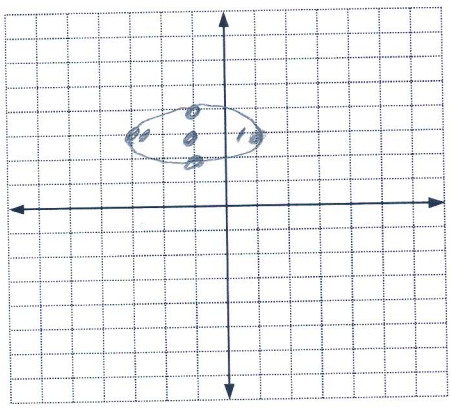
Write each equation in standard form. Graph each ellipse. Find the center, vertices, covertices, foci, and lengths of the major and minor axes for each ellipse whose equation is given.

1. $x^2 + 4y^2 + 2x - 24y + 33 = 0$

C $(-1, 3)$
V $(-3, 3)$ $(1, 3)$
CV $(-1, 4)$ $(-1, 2)$
F $(-1 \pm \sqrt{3}, 3)$
major length = 4
minor length = 2

$(x^2+2x+1) + 4(y^2-6y+9) = -33$
$+1 \quad +36$
$(x+1)^2 + 4(y-3)^2 = 4$
$\frac{(x+1)^2}{4} + \frac{(y-3)^2}{1} = 1$
$a = 2 \qquad b = 1$

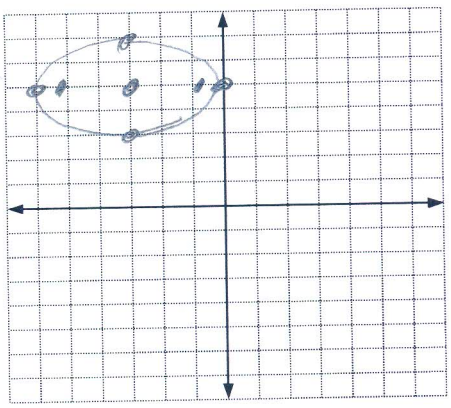


$c^2 = 4 - 1 = 3$
$c = \pm\sqrt{3}$

2. $4x^2 + 9y^2 + 24x - 90y = -225$

C $(-3, 5)$
V $(-6, 5)$ $(0, 5)$
CV $(-3, 7)$ $(-3, 3)$
F $(-3 \pm \sqrt{5}, 5)$
major length = 6
minor length = 4

$4(x^2+6x+9) + 9(y^2-10y+25) = -225$
$+36 \quad +225$
$4(x+3)^2 + 9(y-5)^2 = 36$
$\frac{(x+3)^2}{9} + \frac{(y-5)^2}{4} = 1$
$a = 3 \qquad b = 2$

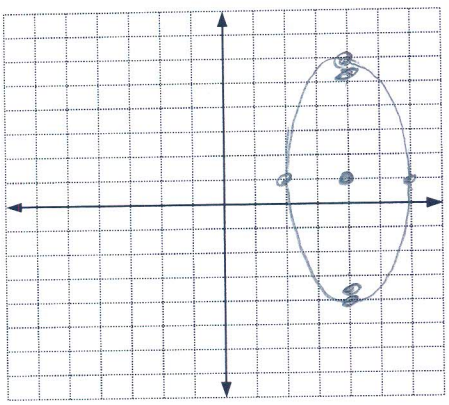


$c^2 = 9 - 4 = 5$
$c = \pm\sqrt{5}$

3. $25x^2 + 4y^2 - 200x - 8y + 304 = 0$

C $(4, 1)$
V $(4, -4)$ $(4, 6)$
CV $(2, 1)$ $(6, 1)$
F $(4, 1 \pm \sqrt{21})$
major length = 10
minor length = 4

$25(x^2-8x+16) + 4(y^2-2y+1) = -304$
$+400 \quad +4$
$25(x-4)^2 + 4(y-1)^2 = 100$
$\frac{(x-4)^2}{4} + \frac{(y-1)^2}{25} = 1$
$b = 2 \qquad a = 5$



$c^2 = 25 - 4 = 21$
$c = \pm\sqrt{21}$

Write the standard form equation of each ellipse.

4. Write the equation of the ellipse at center (0, 0) with vertex (0, 2) and co-vertex (−1, 0).

$$\frac{x^2}{1} + \frac{y^2}{4} = 1$$

vertical

$a = 2$

$b = 1$

5. Write the equation of the vertical ellipse at center (−2, 3) having major axis of length 10 and minor axis of length 6.

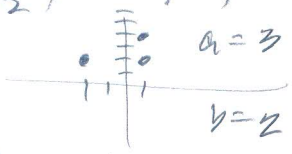
$b = 3$ $\quad a = 5$

$$\frac{(x+2)^2}{9} + \frac{(y-3)^2}{25} = 1$$

6. Find an equation of the ellipse with vertices at (− 2, 2) and (4, 2), and co-vertices at (1, 4) and (1, 0).

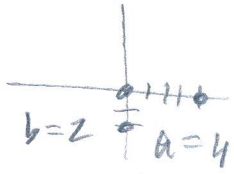
$$\frac{(x-1)^2}{9} + \frac{(y-2)^2}{4} = 1$$

center: $\left(\frac{2}{2}, \frac{4}{2}\right) = (1, 2)$



7. Write the equation of the ellipse at center (0, 0) with vertex (4, 0) and co-vertex (0, −2).

$$\frac{x^2}{16} + \frac{y^2}{4} = 1$$



8. Write the equation of the vertical ellipse at center (4, −1) having minor axis of length 8 and major axis of length 14.

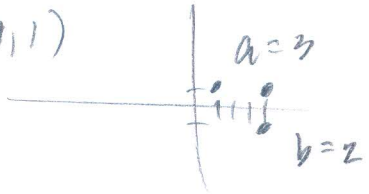
$a = 7$ $\quad b = 4$

$$\frac{(x-4)^2}{16} + \frac{(y+1)^2}{49} = 1$$

9. Find an equation of the ellipse with vertices at (1, 1) and (7, 1), and co-vertices at (4, −1) and (4, 3).

$$\frac{(x-4)^2}{9} + \frac{(y-1)^2}{4} = 1$$

$C: \left(\frac{8}{2}, \frac{2}{2}\right) = (4, 1)$



10. Write the equation of an ellipse with V(−3, −4) and CV(−7, 1).

$$\frac{(x+3)^2}{16} + \frac{(y-1)^2}{25} = 1$$