

Ellipses – Writing Equations

Example 5:

Write each equation in standard form.

$$9x^2 + 4y^2 - 54x + 40y + 37 = 0$$

- ① Rearrange terms  $(9x^2 - 54x) + (4y^2 + 40y) = -37$
- ② Factor out lead coefficients  $9(x^2 - 6x + 9) + 4(y^2 + 10y + 25) = -37 + 81 + 100$
- ③ Complete the square  $\quad \quad \quad \uparrow \quad \quad \quad \uparrow \quad \quad \quad \uparrow \quad \quad \uparrow$
- ④ Factor/Simplify  $9(x-3)^2 + 4(y+5)^2 = 144$
- ⑤ Divide so equation = 1  $\frac{9(x-3)^2}{144} + \frac{4(y+5)^2}{144} = \frac{144}{144}$

$$\boxed{\frac{(x-3)^2}{16} + \frac{(y+5)^2}{36} = 1}$$

Example 6:

Write each equation in standard form.

$$x^2 + 4y^2 - 6x + 8y - 3 = 0$$

$$x^2 - 6x + 4y^2 + 8y = 3$$

$$(x^2 - 6x + 9) + 4(y^2 + 2y + 1) = 3 + 9 + 4$$

$$\frac{(x-3)^2}{16} + \frac{4(y+1)^2}{16} = \frac{16}{16}$$

$$\boxed{\frac{(x-3)^2}{16} + \frac{(y+1)^2}{4} = 1}$$

## Writing Equations of Ellipses Notes

### Example 8:

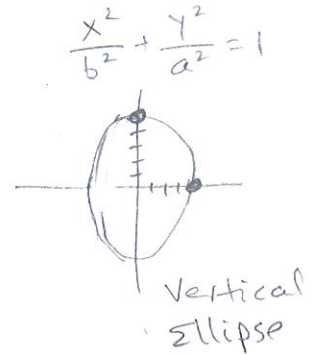
Write an equation of each ellipse.

center: (0, 0)

vertex: (0, 5)  $a=5$

co-vertex: (4, 0)  $b=4$

$$\frac{x^2}{16} + \frac{y^2}{25} = 1$$



### Example 9:

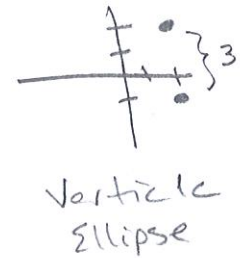
center: (2, -1)

vertex: (2, 2)  $a=3$

minor axis length 2

$\rightarrow b=1$

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



### Example 10:

vertices: (2, 4) and (2, -2)

co-vertices: (0, 1) and (4, 1)

center (2, 1)

$a=3$

$b=2$

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

