

For each ellipse, tell whether the major axis is horizontal or vertical. List the center, the vertices, the co-vertices and the foci. Make a rough sketch of the ellipse.

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

$$c^2 = 25 - 16$$

$$c^2 = 9$$

$$c = 3$$

Horiz
 CENTER (0, -3)
 VERTICES (-5, -3) & (5, -3)
 CO-V (0, 1) & (0, -7)
 FOCI (-3, -3) & (3, -3)

$$2. \frac{(x-4)^2}{30} + \frac{(y-9)^2}{5} = 1$$

$$c^2 = 30 - 5$$

$$c = 5$$

Horiz
 CENTER (4, 9)
 VERT (4 ± √30, 9)
 COV (4, 9 ± √5)
 FOCI (4 ± 5, 9) = (9, 9) & (-1, 9)

$$3. \frac{x^2}{21} + \frac{y^2}{36} = 1$$

$$c^2 = 36 - 21$$

$$c^2 = 15$$

$$c = \sqrt{15}$$

CENTER (0, 0)
 VERT (0, ±6)
 COV (±√21, 0)
 FOCI (0, ±√15)

$$4. \frac{(x+5)^2}{18} + \frac{(y-2)^2}{9} = 1$$

$$c^2 = 9$$

$$c = 3$$

CENTER (-5, 2)
 VERT (-5 ± 3√2, 2)
 COV (-5, 2 ± 3) = (-5, 5) & (-5, -1)
 FOCI (-5 ± 3, 2) = (-2, 2) & (-8, 2)

$$5. \frac{(x-10)^2}{1} + \frac{(y+4)^2}{3} = 1$$

$$c^2 = 3 - 1 = 2$$

$$c = \sqrt{2}$$

CENTER (10, -4)
 VERT (10, -4 ± √3)
 COV (10 ± 1, -4) = (11, -4) & (9, -4)
 FOCI (10, -4 ± √2)

For each ellipse below, write the equation.

6. Center (0,0), vertices (4, 0) & (-4, 0), co-vertices (0,2) & (0, -2)

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

7. Vertices (14,0) & (-14, 0), Foci ($3\sqrt{19}$, 0) & $-3\sqrt{19}$, 0)

CENTER (0, 0)

$$c^2 = (3\sqrt{19})^2 = 171$$

$$171 = 196 - b^2$$

$$b^2 = 25$$

$$\frac{x^2}{196} + \frac{y^2}{25} = 1$$

8. Foci (7,9) & (-1, 9), Co-vertices (3, 12) & (3, 6)

CENTER (3, 9)

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

$$a = 4$$
$$b = 3$$

$$16 = a^2 - 9$$
$$25 = a^2$$

9. Foci ($\sqrt{115}$, 0) & $-\sqrt{115}$, 0), Endpoints of the major axis ($\sqrt{195}$, 0) & $-\sqrt{195}$, 0)

$$\frac{x^2}{195} + \frac{y^2}{80} = 1$$

$$115 = 195 - b^2$$
$$b^2 = 80$$

10. Major Axis is vertical, Center (8, -2), Major Axis is 18 units long, Minor Axis is 8 units long

$$\frac{(x-8)^2}{16} + \frac{(y+2)^2}{81} = 1$$