9.4 Graph and Write Equations of Ellipses *pp. 634–639*

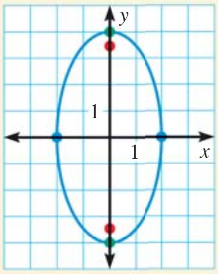
EXAMPLE

Graph $4x^2 + y^2 = 16$. Identify the vertices, co-vertices, and foci.

STEP 1 **Rewrite** $4x^2 + y^2 = 16$ in standard form as $\frac{x^2}{4} + \frac{y^2}{16} = 1$.

STEP 2 **Identify** the vertices, co-vertices, and foci. Note that $a^2 = 16$ and $b^2 = 4$, so $a = 4$, $b = 2$, and $c^2 = a^2 - b^2 = 12$, or $c \approx 3.5$. The major axis is vertical. The vertices are at $(0, \pm 4)$. The co-vertices are at $(\pm 2, 0)$. The foci are at $(0, \pm 3.5)$.

STEP 3 **Draw** the ellipse.



EXERCISES

EXAMPLES 1, 2, and 4 on pp. 635–636 for Exs. 21–25

Graph the equation. Identify the vertices, co-vertices, and foci of the ellipse.

21. $16x^2 + 25y^2 = 400$ **22.** $81x^2 + 9y^2 = 729$ **23.** $64x^2 + 36y^2 = 2304$

Write an equation of the ellipse with the given characteristics and center at (0, 0).

24. Vertex: $(-6, 0)$; co-vertex: $(0, -3)$ **25.** Vertex: $(0, -8)$; focus: $(0, 5)$

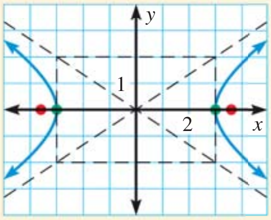
9.5 Graph and Write Equations of Hyperbolas *pp. 642–648*

EXAMPLE

Graph $4x^2 - 9y^2 = 36$. Identify the vertices, foci, and asymptotes.

STEP 1 **Rewrite** $4x^2 - 9y^2 = 36$ in standard form as $\frac{x^2}{9} - \frac{y^2}{4} = 1$.

STEP 2 **Identify** the vertices, foci, and asymptotes. Note that $a^2 = 9$ and $b^2 = 4$, so $a = 3$, $b = 2$, and $c^2 = a^2 + b^2 = 13$, or $c \approx 3.6$. The transverse axis is horizontal. The vertices are at $(\pm 3, 0)$. The foci are at $(\pm 3.6, 0)$. The asymptotes are $y = \pm\frac{b}{a}x = \pm\frac{2}{3}x$.



STEP 3 **Draw** asymptotes through opposite corners of a rectangle centered at (0, 0) that is $2a = 6$ units wide and $2b = 4$ units high. Draw the hyperbola.

EXERCISES

EXAMPLES 1 and 2 on p. 643 for Exs. 26–30

Graph the equation. Identify the vertices, foci, and asymptotes.

26. $9x^2 - y^2 = 9$ **27.** $4x^2 - 16y^2 = 64$ **28.** $100y^2 - 36x^2 = 3600$

Write an equation of the hyperbola with the given foci and vertices.

29. Foci: $(0, \pm 5)$; vertices: $(0, \pm 2)$ **30.** Foci: $(\pm 9, 0)$; vertices: $(\pm 4, 0)$