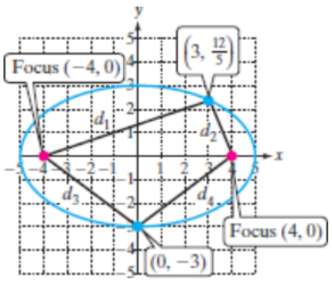
11.1, # 9 (extended): Consider the ellipse and the points depicted below.



(a). How do the values $d_1 + d_2$ and $d_3 + d_4$ compare?

(b). Compute $d_1 + d_2$. (No need to justify).

(c). How does $d_1 + d_2$ relate to the quantities a,b, and/or c from the general ellipse equation?

(d). Find the equation of the ellipse.

(e). Find the eccentricity of the ellipse.

(f). What does the eccentricity tell us about the proximity of the foci and vertices (at $x = \pm a$)?

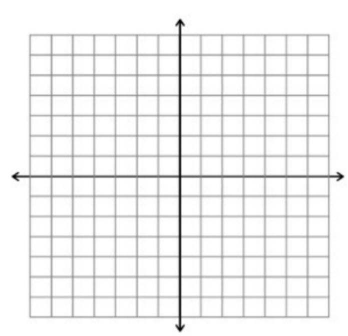
(g). If the eccentricity were closer to 0, would the ellipse be more elongated, or would it be more circular?

11.1, # 11 (extended),20: For the following ellipses, determine whether the major axis is horizontal or vertical, then find the values of a, b, and c and use them to identify the vertices, foci, endpoints of the minor axis, and lengths of the major and minor axis.

(a). $\frac{x^2}{2} + \frac{y^2}{5} = 1.$

(b). $\frac{x^2}{5} + \frac{y^2}{2} = 1.$

(c). $-64x^2 - 16y^2 = -64.$ (For this one, use the space below to graph it too.)



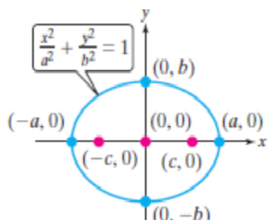
Standard Forms of an Equation of an Ellipse Centered at the Origin

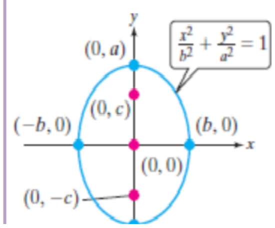
The standard forms of an equation of an ellipse centered at the origin are as follows. Assume that

- $a > b > 0$.
- The length of the major axis is $2a$, and the length of the minor axis is $2b$.

	Major Axis: x-axis	**Major Axis: y-axis**
Equation:	$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$
Center:	(0, 0)	(0, 0)
Foci: (*Note*: $c^2 = a^2 - b^2$)	$(c, 0)$ and $(-c, 0)$	$(0, c)$ and $(0, -c)$
Vertices: Endpoints: major axis	$(a, 0)$ and $(-a, 0)$	$(0, a)$ and $(0, -a)$
Endpoints: minor axis	$(0, b)$ and $(0, -b)$	$(b, 0)$ and $(-b, 0)$

Graph:





Standard Forms of an Equation of a Hyperbola Centered at the Origin

The standard forms of an equation of a hyperbola centered at the origin are as follows. Assume that $a > 0$ and $b > 0$.

	Transverse Axis: x-axis	**Transverse Axis: y-axis**
Equation:	$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$	$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$
Center:	(0, 0)	(0, 0)
Foci: ($c^2 = a^2 + b^2$)	$(c, 0)$ and $(-c, 0)$	$(0, c)$ and $(0, -c)$
Vertices:	$(a, 0)$ and $(-a, 0)$	$(0, a)$ and $(0, -a)$
Asymptotes:	$y = \frac{b}{a}x$ and $y = -\frac{b}{a}x$	$y = \frac{a}{b}x$ and $y = -\frac{a}{b}x$

Graph:

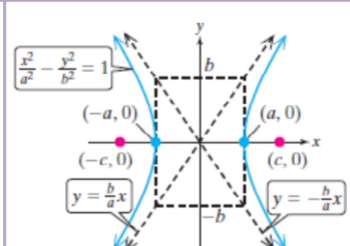


Figure 11-14

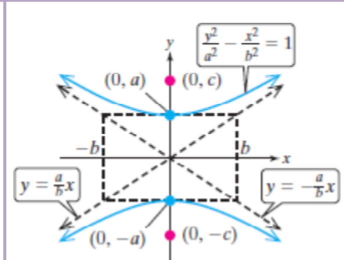
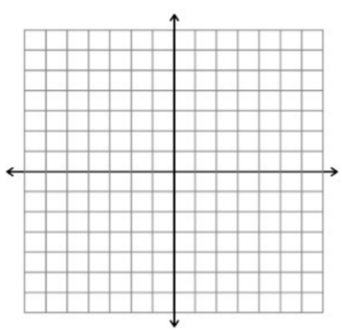


Figure 11-15

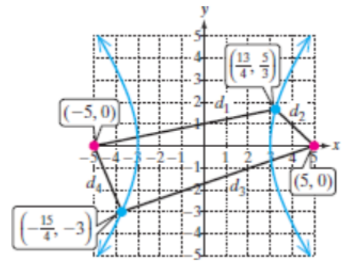
11.1, # 75: The moon's orbit around the Earth is elliptical with the Earth at one focus and with eccentricity 0.0549. If the distance between the moon and Earth at the closest point is 363,300 km, determine the distance at the farthest point. Round to the nearest 100 km.

11.2, # 17: Consider the hyperbola defined by the equation $25y^2 - 81x^2 = 2025$. Identify the vertices, foci, and asymptotes. Then, graph the hyperbola.



11.2, # 63: Atomic particles with like charges tend to repel one another. Suppose that two beams of like-charged particles are hurled toward each other from two parallel atomic accelerators. The path defined by the particles is $x^2 - 4y^2 = 36$ (one branch for each particle, one going up, the other going down), where x and y are measured in microns. What is the minimum distance between the particles?

11.2, # 7 (extended): Consider the hyperbola and the points depicted below.



(a). How do the values $d_1 - d_2$ and $d_3 - d_4$ compare?

(b). Compute $d_1 - d_2$.

(c). How does $d_1 - d_2$ relate to the quantities a,b, and/or c from the general hyperbola equation?

(d). Identify the transverse axis.

.

(e). Find the equation of the hyperbola.

(f). Identify the asymptotes of the hyperbola. Draw them on the graph.

(g). Find the eccentricity of the hyperbola.

(h). What does the eccentricity tell us about the proximity of the foci and vertices (at $x = \pm a$)?

(i). If the eccentricity were closer to 1, would the ellipse be wider, or would it be narrower?