Precalculus

8.3 Conic Sections-Ellipse

Name_____ Date_____ Per_____

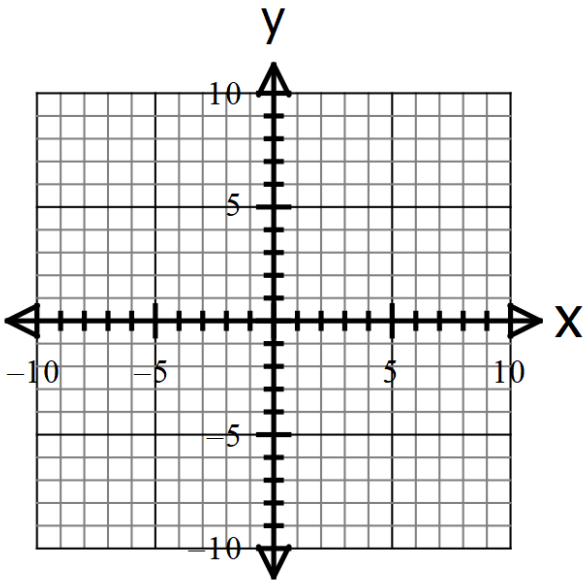
Identify the center, vertices, and foci of each ellipse, then draw the graph (including the foci).

1. $x^2+\frac{y^2}{9}=1$

center

vertices

foci

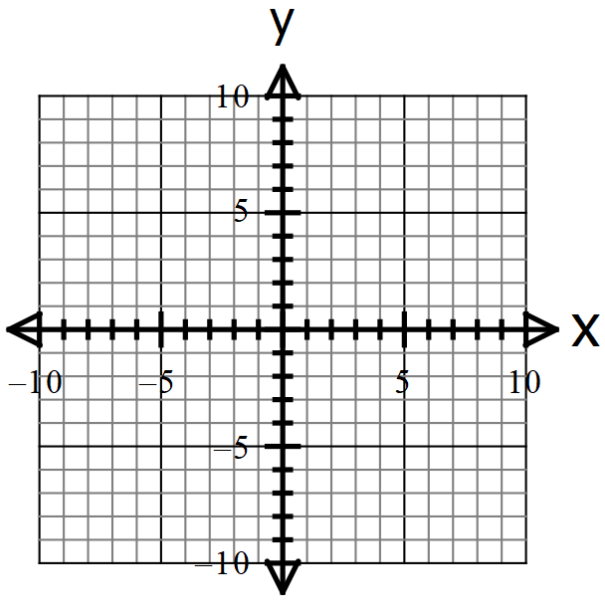


2. $\frac{x^2}{36}+\frac{y^2}{49}=1$

center

vertices

foci

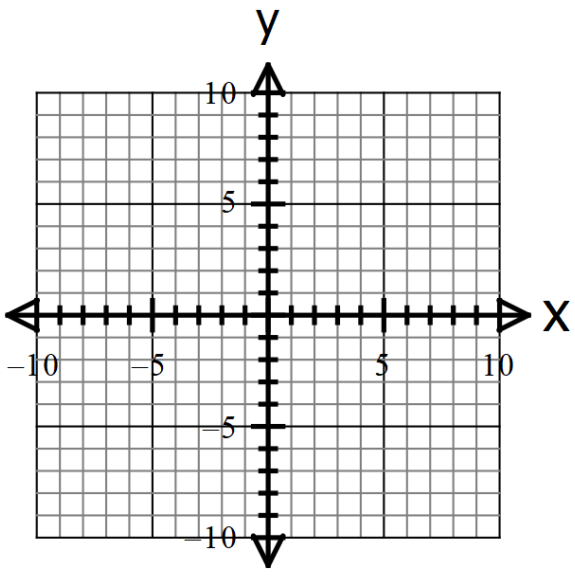


3. $\frac{x^2}{15}+\frac{y^2}{40}=1$

center

vertices

foci

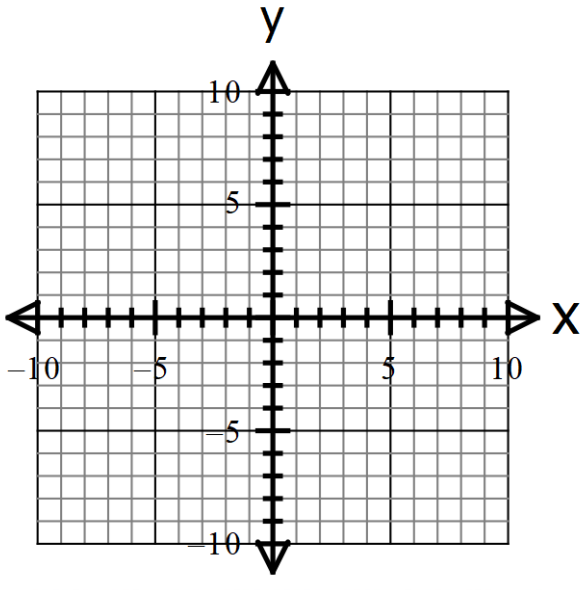


4. $16x^2+25y^2=400$

center

vertices

foci

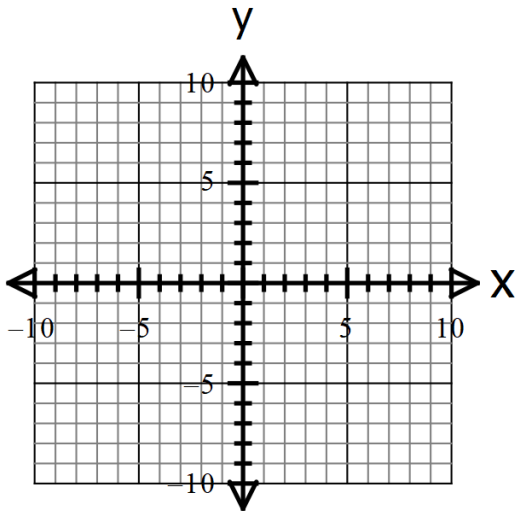


5. $\frac{(x-2)^2}{49}+\frac{y^2}{81}=1$

center

vertices

foci

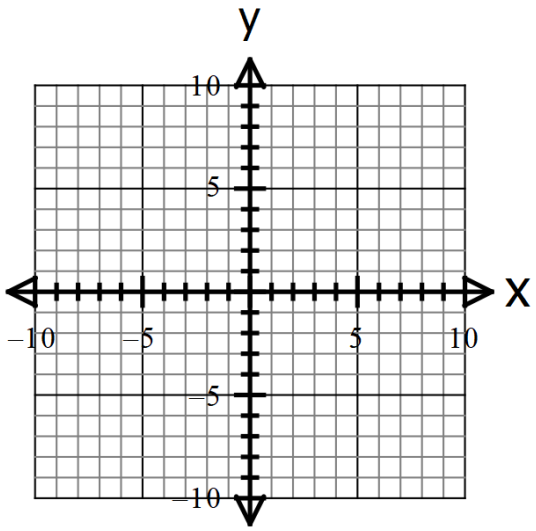


6. $\frac{(x+3)^2}{16}+\frac{(y-5)^2}{4}=1$

center

vertices

foci

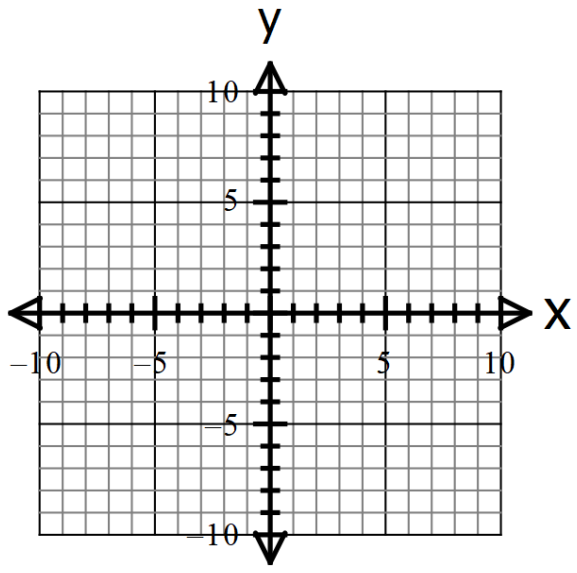


7. $\frac{(x+1)^2}{35}+\frac{(y+2)^2}{10}=1$

center

vertices

foci

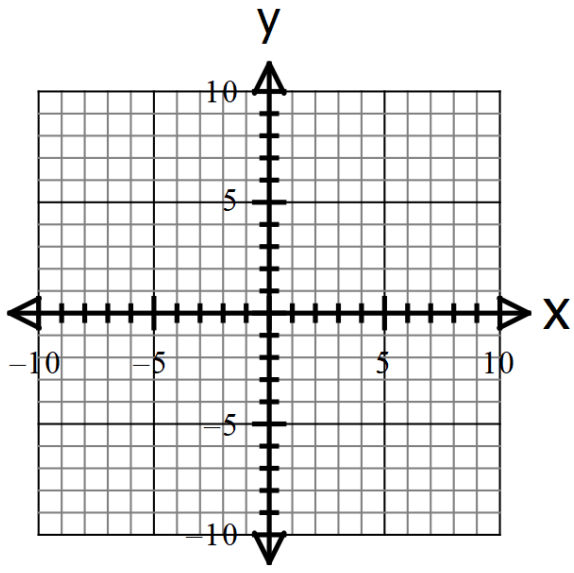


8. $9(x+7)^2+(y-4)^2=36$

center

vertices

foci



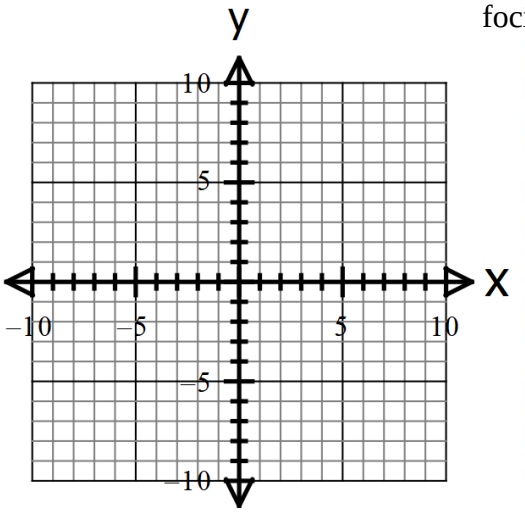
Convert each equation to standard form by completing the square. Identify the center, vertices, and foci of the ellipse, then draw the graph (including the foci).

9. $x^2+16y^2-32y=0$

center

vertices

foci

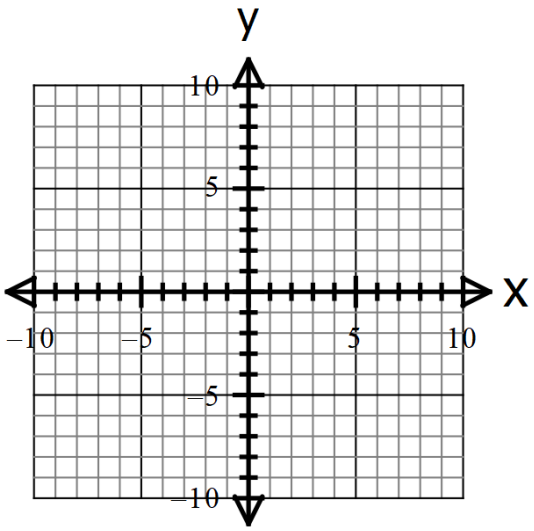


10. $16x^2+y^2-160x+336=0$

center

vertices

foci

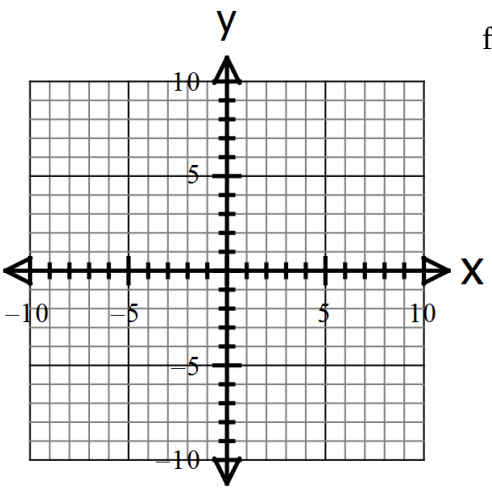


11. $x^2+4y^2+2x-48y+129=0$

center

vertices

foci

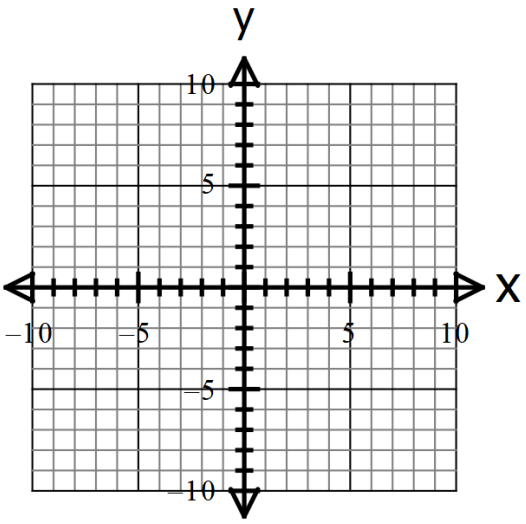


12. $9x^2+4y^2+54x-16y-227=0$

center

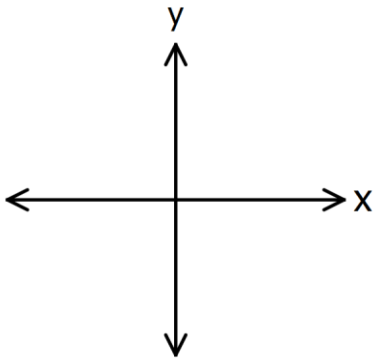
vertices

foci

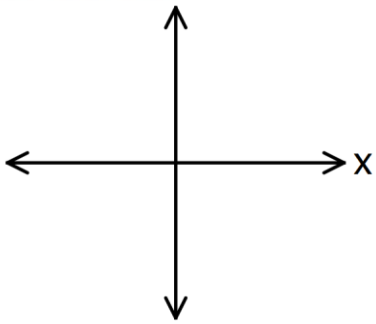


Find an equation in standard form for the ellipse with the given features.

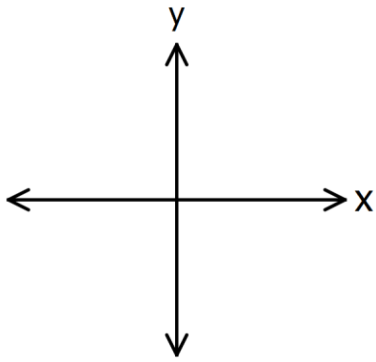
13. Center: $(0,0)$; Focus: $(3,0)$; Vertex: $(5,0)$



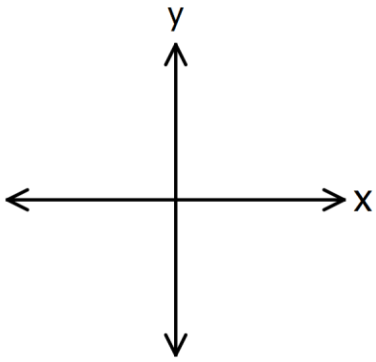
14. Center: $(2,-2)$; Vertex: $(2,-7)$; Focus: $(2,0)$



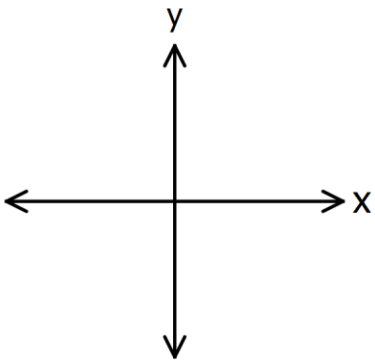
15. Foci: $(5,1)$ and $(-1,1)$; length of major axis is 8



16. Vertices: $(8,17)$ and $(8,-5)$; Focus: $\left(8,6+\sqrt{21}\right)$



17. Vertices: $\left(-3\pm 2\sqrt{10},-9\right)$; Focus: $\left(-3+\sqrt{5},-9\right)$

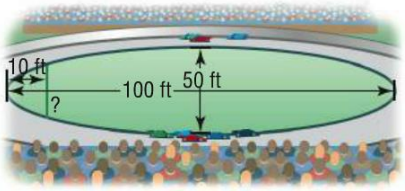


Solve the problem.

18. The whispering gallery in the Museum of Science and Industry in Chicago is 47.3 feet long. The foci are 20.3 feet from the center of the room. How high is the room at its center?

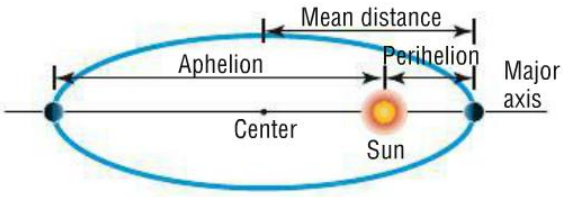
19. A bridge is built in the shape of a semielliptical arch. The bridge has a span of 120 feet and a maximum height of 25 feet. Choose a suitable rectangular coordinate system and find the height of the arch at distances of 10, 30, and 50 feet from the center.

20. A racetrack is in the shape of an ellipse 100 feet long and 50 feet wide. What is the width 10 feet from a vertex?



21. A football is in the shape of a ***prolate spheroid,*** which is a solid obtained by rotating an ellipse around its major axis. An inflated NFL football averages 11.125 inches in length and 28.25 inches in center circumference. If the volume of a prolate spheroid is $\frac{4}{3}\pi ab^2$, about how much air does the football contain? (Neglect material thickness).

The orbit of a planet around the sun is an ellipse, with the sun at one focus. The *aphelion* of a planet is its greatest distance from the sun, and the *perihelion* is its shortest distance. The *mean distance* of a planet from the sun is the length of the semimajor axis of the elliptical orbit.



22. The aphelion of Jupiter is 507 million miles. If the distance from the center of its elliptical orbit to the sun is 23.2 million miles, what is the perihelion? What is the mean distance? Write an equation for the orbit of Jupiter around the sun.

23. The mean distance of Earth from the sun is 93 million miles. If the aphelion of Earth is 94.5 million miles, what is the perihelion? Write an equation for the orbit of Earth around the sun.

24. The ***eccentricity e*** of an ellipse is a measure of its roundness and is defined as $e = c/a$. Halley's comet orbits the sun in an elliptical orbit of eccentricity 0.9673 with the sun at one focus. The greatest distance of the comet from the sun is 3281 million miles. Find the least distance between Halley's comet and the sun to the nearest million miles.