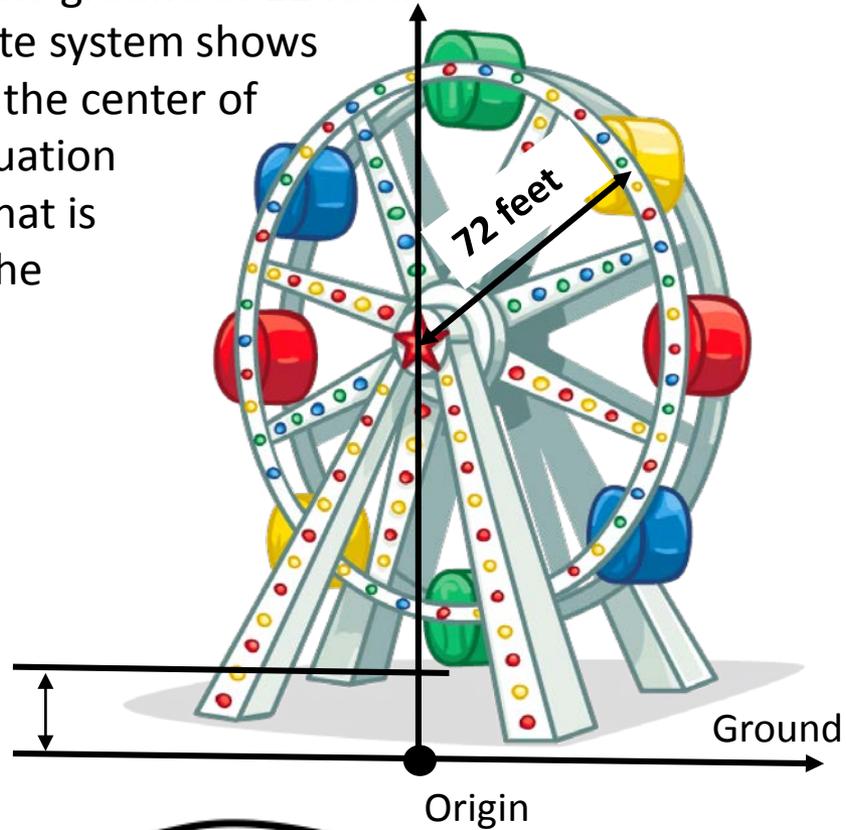


The ferris wheel has a radius of 72 feet, with a clearance between the wheel and the ground of 12 feet. The rectangular coordinate system shows the origin directly below the center of the wheel. Write the equation for the circular wheel. What is the maximum height of the ferris wheel?

1

12 ft. Clearance



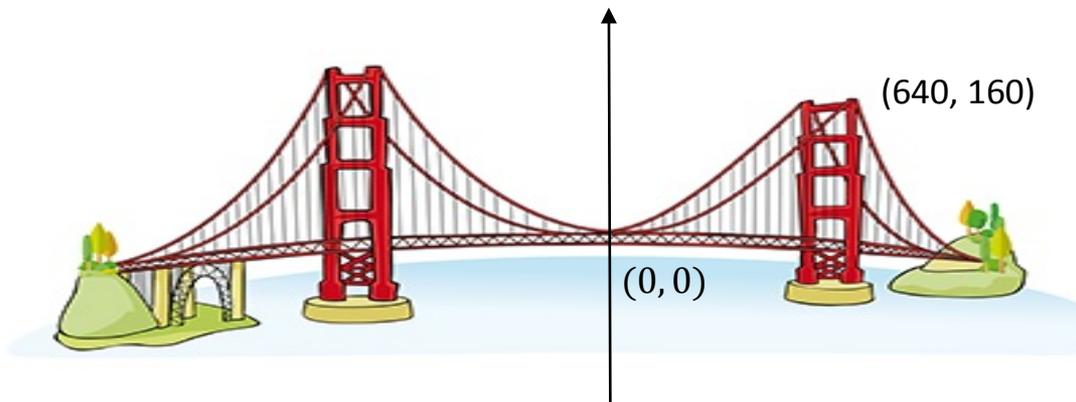
The elliptical ceiling in Statuary Hall in the U.S. Capitol Building is 23 feet tall and 96 feet long. John Quincy Adams discovered that he could hear the conversations of the opposing party leaders near the left side of the chamber if he placed his desk at the focus on the right side of the chamber. How far, to the nearest foot, from the center of the ellipse along the major axis did Adams place his desk?

2

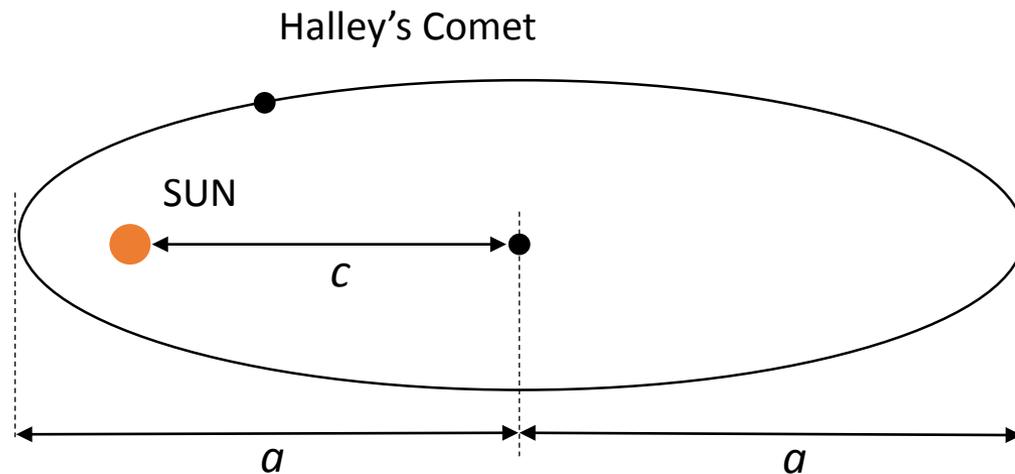


The towers of the Golden Gate Bridge across San Francisco Bay are 1280 meters apart and rise 160 meters above the road. The cable between the towers is shaped like a parabola, and the cable just touches the sides of the road midway between the towers. Find the height of the cable 200 meters from the tower.

3

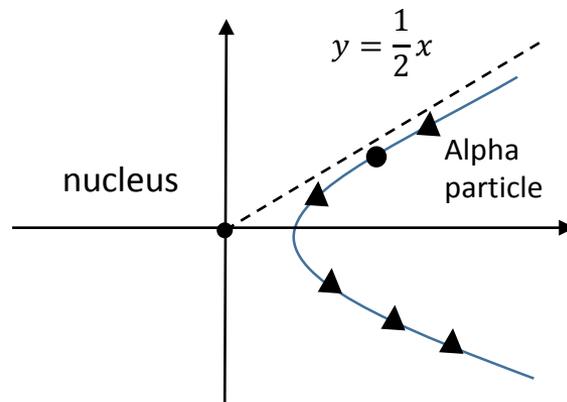


Halley's comet has an elliptical orbit with eccentricity $e = 0.967$. By measuring distance in astronomical units, the closest that Halley's comet comes to the sun is $0.587 AU$. Approximate the maximum distance of the comet from the sun, to the nearest $0.1 AU$. Note: $e = \frac{c}{a}$



4

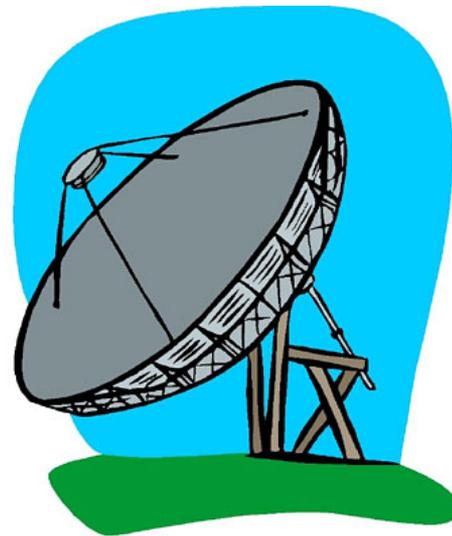
In 1911, physicist Ernest Rutherford discovered that when alpha particles are shot toward the nucleus of an atom, they are eventually repulsed away from the nucleus along hyperbolic pathways. If a particle gets as close as 3 units to the nucleus along a hyperbolic path with an asymptote given by $y = \frac{1}{2}x$. Find an equation of the path.



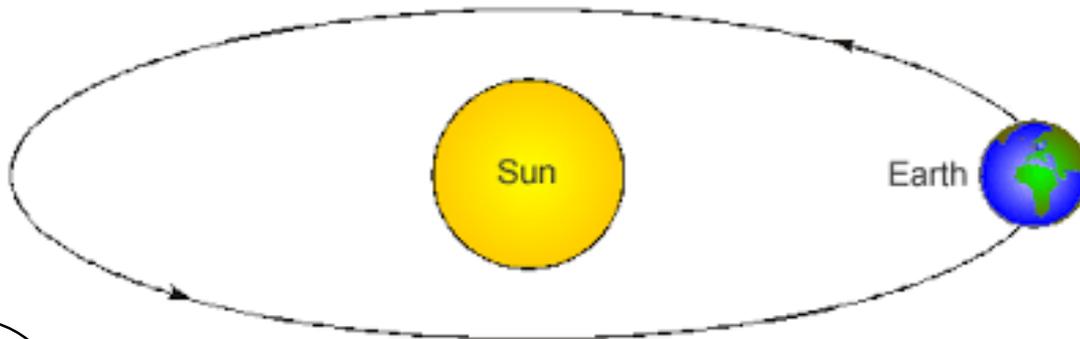
5

A satellite dish in the shape of a parabolic surface is 12 feet across and 2 feet deep. Satellite signals strike the surface of the dish and are reflected to the focus, where the receiver is located. How far from the base of the dish should the receiver be placed?

6



Assume that the length of the major axis of the earth's orbit is 186,000,000 miles and the eccentricity is 0.017. Find the maximum and minimum distances between the Earth and the Sun to the nearest 100 miles.

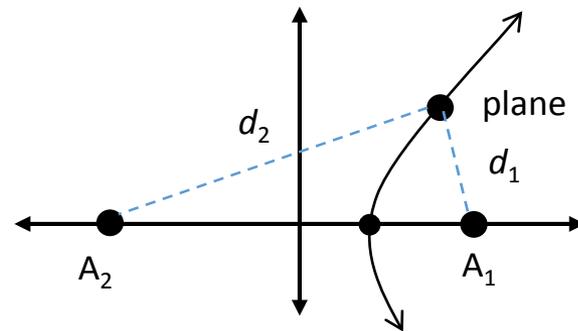


7

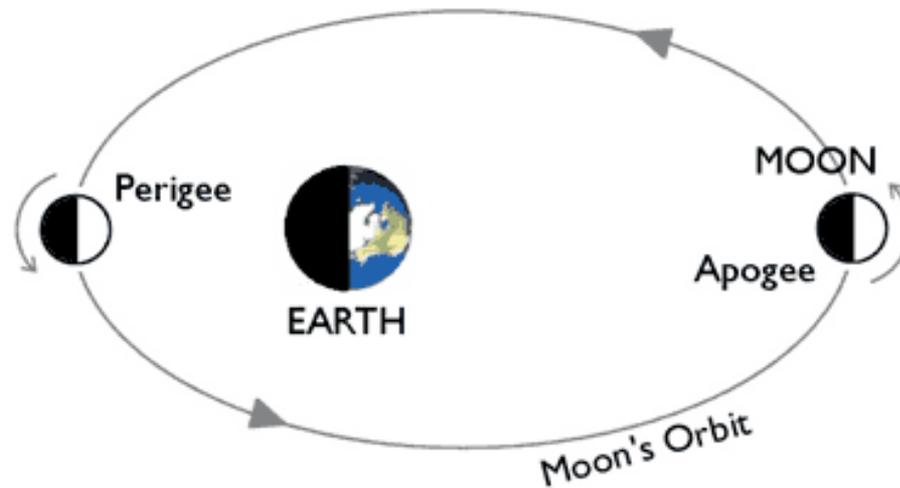
You are an air traffic controller directing the pilot of a plane on a hyperbolic flight path. You and another air traffic controller from a different airport send radio signals to the pilot at the same time. The two airports are 48 miles apart. The pilot's instrument panel tells him that the signal from your airport always arrives 6 seconds before the signal from the other airport. If the signals travel at a rate of 1100 ft/sec, what is the difference in distances, k , from the plane to the two airports? Write the equation of the flight path.

Hint: $k = 2a$ also $d_2 - d_1 = k$

8

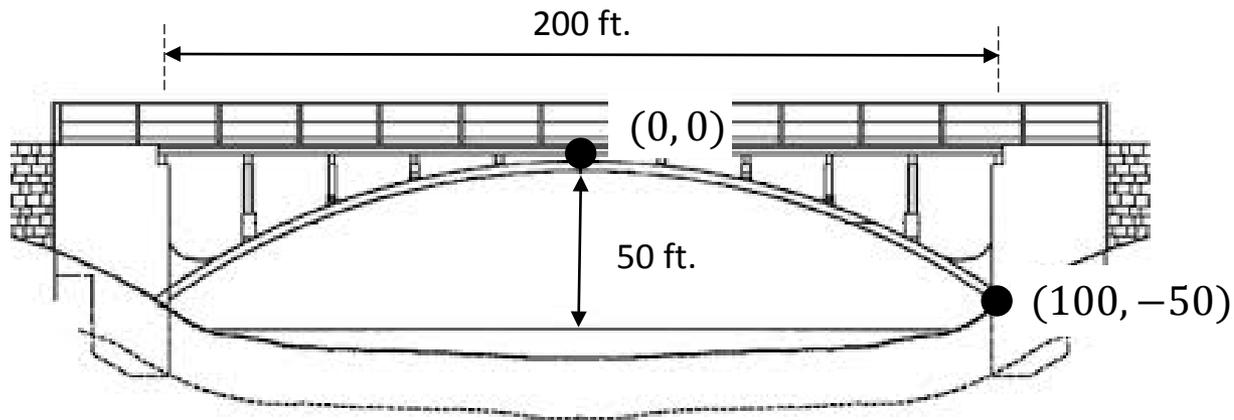


The Moon's apogee (farthest distance from Earth) is 252,710 miles, and perigee (closest distance to Earth) is 221,463 miles. Assuming the Moon's orbit of Earth is elliptical with Earth at one focus, calculate and interpret a , b , c , and e .



9

The parabolic arch of a bridge over a small river is 50 feet above the water at the center and 200 feet wide at the base. Is it possible for a sailboat that is 30 feet tall to clear the arch 30 feet from the center of the bridge?



10