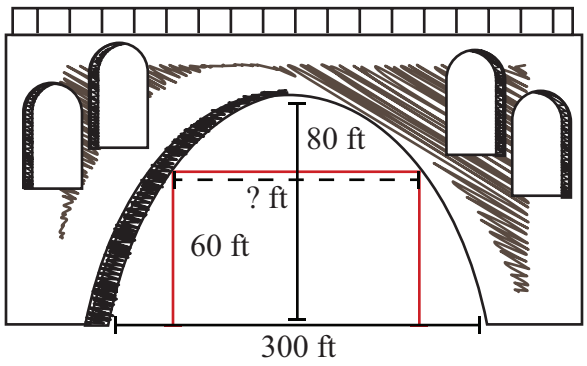
CHAPTER 11 PROJECT

Constructing a Bridge

Plans are in process to develop an uninhabited coastal island into a new resort. Before development can begin, a bridge must be constructed joining the island to the mainland.

Two possibilities are being considered for the support structure of the bridge. The archway could be built as a parabola, or in the shape of a semiellipse.

Assume all measurements that follow refer to dimensions at high tide. The county building inspector has deemed that in order to establish a solid foundation, the space between supports must be at most 300 feet and the height at the center of the arch should be 80 feet. There is a commercial fishing dock located on the mainland whose fishing vessels travel constantly along this intracoastal waterway. The tallest of these ships requires 60 feet of clearance to pass comfortably beneath the bridge. With these restrictions, the width of a channel with a minimum height of 60 feet has to be determined for both possible shapes of the bridge to confirm that it will be suitable for the water traffic beneath it.



1. Find the equation of a parabola that will fit these constraints.

2. How wide is the channel with a minimum 60-foot vertical clearance for the parabola in question 1?

3. Find the equation of a semiellipse that will fit these constraints.

4. How wide is the channel with a minimum 60-foot vertical clearance for the semiellipse in question 3?

5. Which of these bridge designs would you choose, and why?

6. Suppose the tallest fishing ship installs a new antenna which raises the center height by 12 feet. How far off of center (to the left or right) can the ship now travel and still pass under the bridge without damage to the antenna

   a. for the parabola?
   b. for the semiellipse?