Jack Sparrow
Des Moines, Iowa
September 18, 2006

Math 104 Students
Wheaton College
Norton, MA 02766

Dear Calculus Students:

With my recent cinematic success, I am trying to branch out from the plundering business. My first job is to help with the design of one part of the new Pirates of Caribbean ride that is being built at the as-yet-unannounced DisneyUniverse Park in Des Moines. When I went looking for help with my planning, your enterprising and resourceful professor naturally referred me to you.

I am responsible for the portion of the ride where a replica of the Black Pearl, my beloved ship, is submerged under water with only the top of the masts showing. As the passenger cars come around the corner, the ship will dramatically rise out of water, showing all sorts of scary stuff on deck and railings – skeletons, decaying fish, Backstreet Boys CDs . . . the usual horrors.

For optimal effect, we want the mechanics controlling the raising of the ship to be as innocuous as possible. We will mount four pillars in the floor of the "ocean", two on each side of the Pearl. The two pillars on the same side will be connected by a massive winch, and the Black Pearl will be resting in a special fabric sling that is 50 feet wide and wound around the winches. To raise the boat, motors will turn the winches, causing an appropriate bubbling in the water as the ship rises to the howls of the freaked-out kiddies on the ride. Sounds tremendous, right?

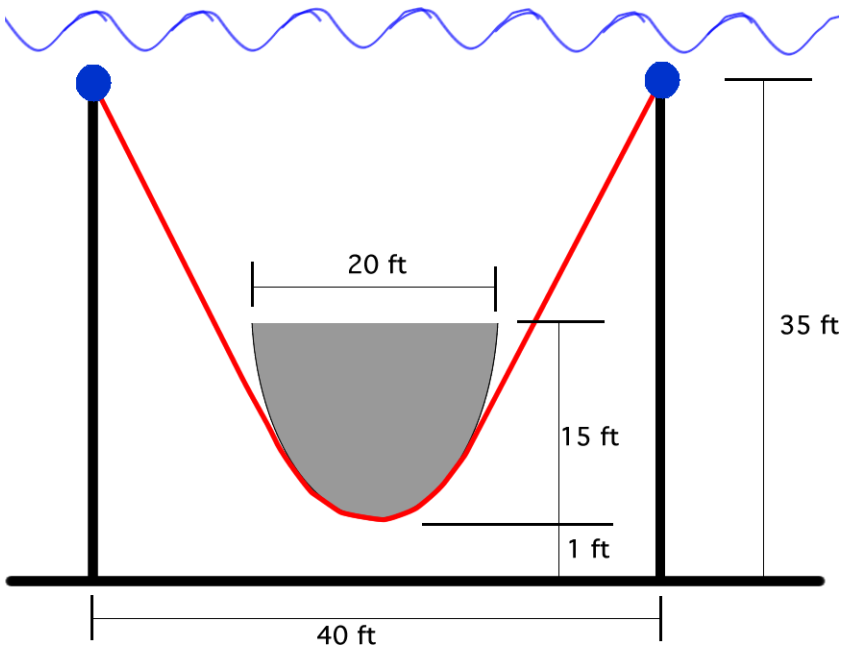
This is where I need your help. The fabric for the sling is freakishly expensive since it must be incredibly strong, barely visible, and able to withstand the disturbing amount of chlorine they dump in the amusement park water. In order to impress my new employers with business acumen, I want to order the *precise* amount of fabric needed for the sling. I know that the fabric that is 50 feet wide, but I am not sure of the other dimension.

After discussing my situation with your enterprising and resourceful professor, he suggested that you might need to know some additional information. The cross-section of my cherished vessel is shaped roughly like a parabola, 20 feet wide and 15 feet high, and the sling will hold the bottom of the ship one foot off the ocean floor when it is at rest. The pillars are 35 feet tall, and those on opposite sides of the hull will be anchored 40 feet apart. I've included a sketch below to illustrate these measurements, which should be enough to answer my questions.

I should be honest. I *think* the pillars will be 40 feet apart, but my handwriting was a little shaky when I was taking these notes (Don't ask. You wouldn't want to know). Just to be on the safe side, I also need to know the *precise* amount of fabric to order if the pillars are 30 feet apart or 50 feet apart. In case I am completely off, I need you to explain your method thoroughly enough so that I could repeat the calculations with the pillars at any reasonable distance.

I realize that the semester is starting to pick up, but I would appreciate your report by October 6.

Yo-Ho-Ho-ily yours,
Jack Sparrow


20 ft
35 ft
15 ft
1 ft
40 ft