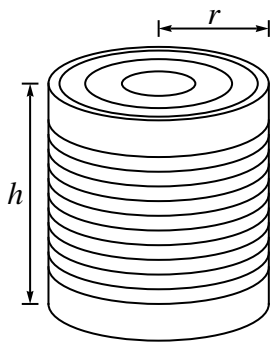
Math 141

Name:_____

Homework 10

1. A company wishes to manufacture cylindrical juice cans made of tin-plated steel:



Here h is the height of the can in centimeters, and r is the radius of the can in centimeters.

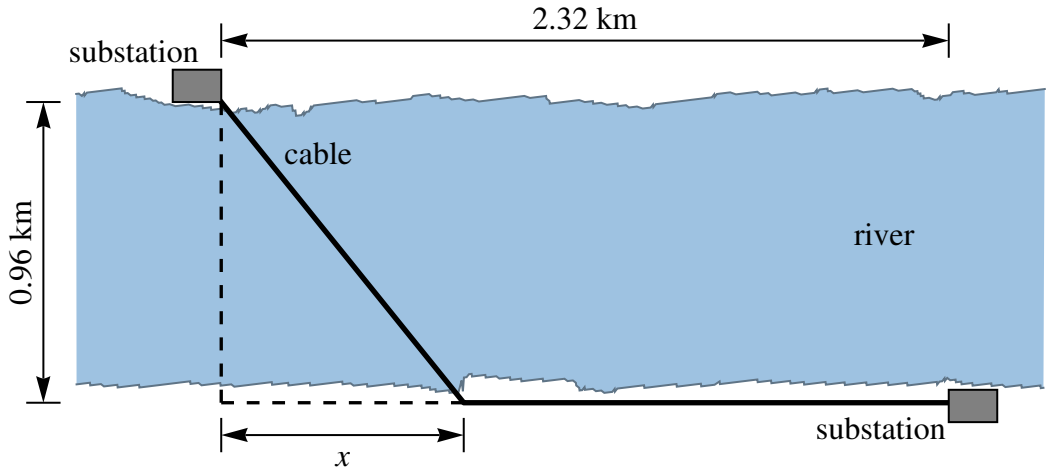
(a) Find a formula for the total surface area of the can in terms of r and h. Make sure to include the top and bottom surfaces, as well as the side.

(b) Each can must hold a liter of juice. Use this constraint to find a formula for h in terms of r. (You may need to look up the conversion between liters and cubic centimeters.)

(c) Use your answers to parts (a) and (b) to find a formula for the surface area in terms of r alone.

(d) Take the derivative of your formula from part (c), and use it to find the value of r that minimizes the surface area of the can.

2. Engineers wish to construct a power transmission cable connecting two power substations on opposite sides of a river:

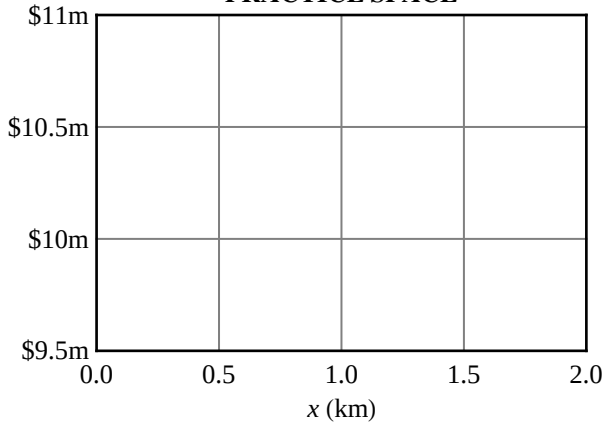


Underwater cable costs \$4.5 million/km, while cable on land costs \$2.7 million/km.

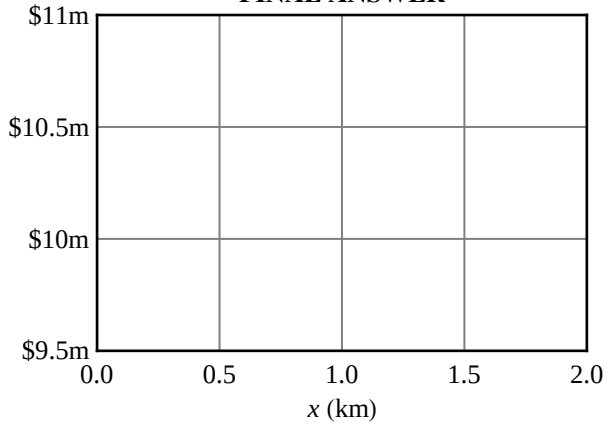
(a) Find a formula for the total cost of the cable as a function of the length x shown in the picture.

(b) Use the following axes to sketch a graph of the total cost as a function of x.

PRACTICE SPACE



FINAL ANSWER



(c) Compute the derivative of your cost formula from part (a).

(d) Use your answer to part (c) to find the value of x that minimizes the cost of the cable. (*Hint:* Start by solving for the square root, and then square both sides.)

(e) Assuming the engineers use the optimal value of x, how much will the cable cost?