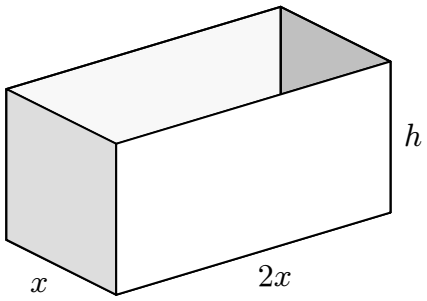
Math 141

Name:_____

Homework 9

1. A freight company wants to manufacture large metal shipping containers. The containers will have the shape of a box with no top, and must be twice as long as they are wide:



Material for the bottoms of the containers costs $\$2/\text{ft}^2$, and material for the sides costs $\$1/\text{ft}^2$.

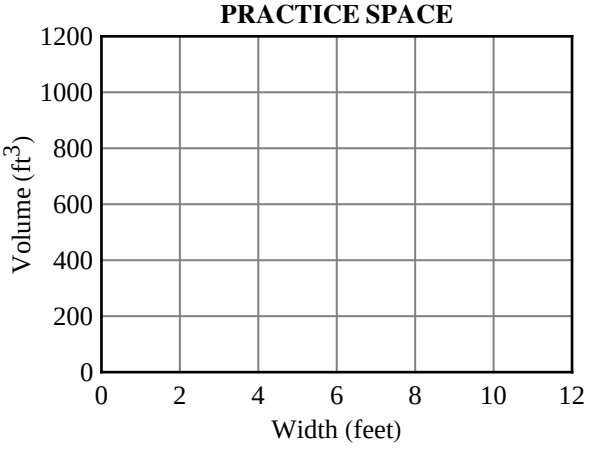
(a) Find a formula for the total cost of one container in terms of x and h.

(b) Suppose we have a budget of \$675 for each container. Use this restriction to find a formula for h in terms of x.

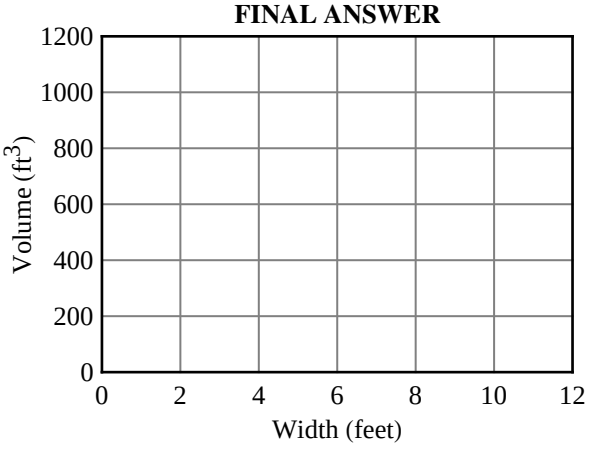
(c) Use your answer to part (b) to find a formula for the volume V of the container in terms of x.

(d) Use the following axes to sketch a graph of the volume V as a function of the width x.

PRACTICE SPACE



FINAL ANSWER

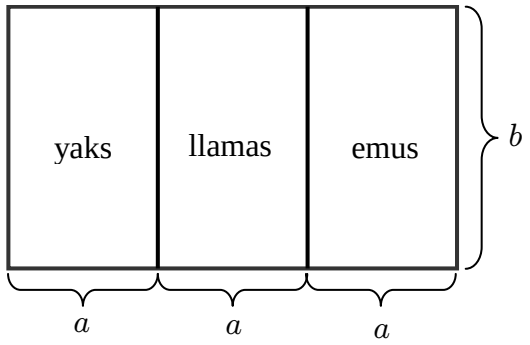


(e) Find a formula for $\dfrac{dV}{dx}$. (Note: You may want to start by simplifying your formula for V.)

(f) Solve the equation $\dfrac{dV}{dx} = 0$ to find the x-coordinate of the local maximum.

(g) What is the maximum possible volume of the shipping container?

2. A rancher wishes to fence off three rectangular pastures to raise herds of yaks, llamas, and emus. To save fence, he is planning to make the pastures adjacent, as shown in the figure below:



(a) Find a formula for the amount of fence used in terms of a and b.

(b) The rancher has 1200 meters of fence. Use this restriction to find a formula for the combined area of the three pastures in terms of a.

(c) Take the derivative of your formula from part (b), and use the result to find the maximum possible combined area of the three pastures.