**MAT1475, Spring 2020**

Homework: An Application of Optimization

Name:

In this assignment, you will apply the principles of optimization we studied in class to a practical problem. Before attempting this assignment, it is suggested that you try working the problems found in the optimization problem set in Webwork <http://mathww.citytech.cuny.edu/webwork2/Guest_Access_-_MAT1475/>.

Problem: A rectangular storage container with an open top is to have a volume of 16 cubic meters. The length of its base is twice the width. Material for the base costs 12 dollars per square meter. Material for the sides costs 4 dollars per square

meter. Find the cost of materials for the cheapest such container.

(Round final answer to the nearest penny and include monetary units. For example, if your answer is 1.095, enter $1.10 including the dollar sign and second decimal place)

1. Sketch the rectangular storage container. Label the length of the base *L,* the

 width the base *w*, and the height of the container *h*.

2. Write the formula for the volume *V* of a rectangular box with length *L,* width *w*,

 and height *h*.

3. In the formula you obtained in question 2, replace *V* with 16 and *L* with 2*w*.

 Then solve for *h* in terms of *w*.

4. Two of the sides of the rectangular container have area *wh*. Two of the sides of

 the rectangular container have area *Lh*. Multiply each by $4 to get the cost of

 the material for the sides. The area of the base is *Lw*. Multiply this area by $12

 to get the cost of the material for the base. Add all these up to get the total cost

 *C* of the material. Replace L with 2*w* and *h* with the formula obtained in

 question 3 to get the formula for C in terms of just the variable w.

5. Take the derivative of the formula for the cost C with respect to *w* obtained in

 question 4 and set it equal to 0. This should give the value of *w* which will

 minimize *C*. Calculate *C* for this value of *w*. This is the answer to the Problem.

6. Check your answer found in question 5 by graphing the function *C* found in

 question 4 as a function of *w*. The graph should show the value of *C* at the value

 of *w* found in question 5 is indeed the minimum value of C on the graph.