

Calculus I: Optimization

First set up, but do not solve the following problems. In other words, find a function of one variable with an appropriate domain that you would find the maximum or minimum of in order to solve the problem. You should be able to pass your set-up to another student to solve as a calculus optimization problem. Finally, solve the problems.

1. The sum of two positive numbers is 48. What is the smallest possible value for the sum of their squares?
2. I want to make a fish tank with a volume of 2m^3 and I would like the base of the tank to be a rectangle twice as long as it is wide. The base and sides of the tank are to be of glass. What shape of tank will use the least amount of glass (and so cost least)?
3. A rectangular storage container with an open top is to have a volume of 10m^3 . The length of its base is twice the width. Material for the base costs \$10 per square meter. Material for the sides costs \$6 per square meter. Find the cost of materials for the cheapest such container.
4. Gustavus is building a new running track. It is to be the perimeter of a region obtained by putting two semicircles on the ends of a rectangle. However, owing to financial constraints, the administration has decided to grow corn in the area surrounded by the track. If the track is to be 440 yards long, determine the necessary dimensions to build the track in order to maximize the area for growing corn.

