MA 22000 Lesson 32 Notes

Review of Guidelines for Optimization Problems (finding maximums or minimums).

An optimization problems involves finding a value that would determine a maximum or minimum for a problem.

For many of these problems, you will have to write two equations initially. The primary equation describes the quantity to be optimized (maximized or minimized.) The secondary equation will help express the primary equation as a function of only one variable.

Guidelines for Solving Optimization Problems:

1) Identify all given information and all quantities to be determined. You might need to sketch a diagram or picture.

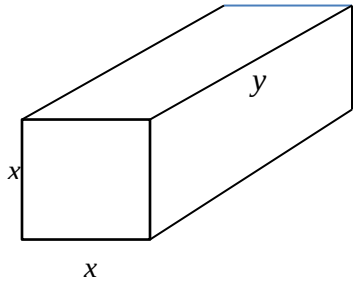
2) Write a primary equation for the quantity that is to be maximized or minimized.

3) Reduce the primary equation to one having a single variable. This may involve the use of a secondary equation.

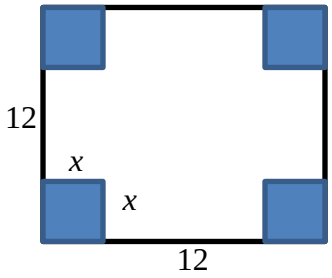
4) Determine a reasonable domain for the primary equation; values that 'make sense'.

5) Find the first derivative of the primary equation to find critical values. Use the techniques discussed in class to determine the value of the variable that gives the maximum or minimum (usually in a closed interval) and what that maximum or minimum value is.

Example 1:
Find the dimensions of a rectangular solid with a square base with a maximum volume, if its surface area is 384 square feet.

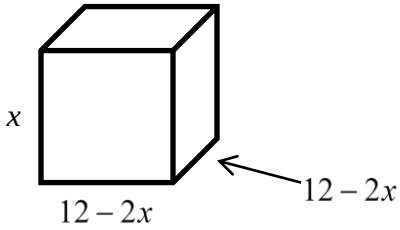


Example 2:
An open-topped box is to be made from a 12 inch square piece of cardstock by cutting equal squares from its corners, turning up the sides, and taping. Find the volume of the largest box (volume) that can be made.

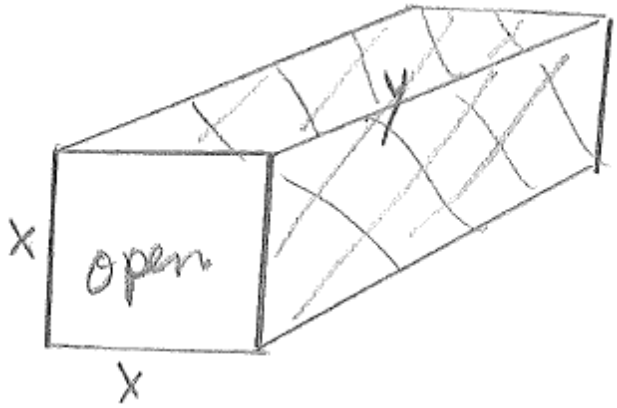


Label the side of each 'cut-out' square as x.

After the sides are turned up:



Example 3:
A net enclosure for golf practice is open at one end. The volume of the enclosure is 144 cubic meters. Find the approximate dimensions that require the smallest amount of netting (minimum area). (Netting is at the back, top, and each side of the entrance.)



Example 4:
An open box is to be made from a 5 feet by 3 feet rectangular piece of material by cutting equal squares from the corners and turning up the sides. Find the approximate volume of the largest box that can be made (largest volume).