5.5 Steps for Solving Optimization Problems

STEP 1: Draw a picture and find the equation related to what is being minimized/maximized.

STEP 2: Find an equation that relates the unknown variables from the Optimization equation and the given information.

STEP 3: Solve the equation in Step 2 for one of the variables and substitute it into the equation in Step 1.

STEP 4: Find the restrictions on your independent variable. Sometimes these are obvious from the drawn picture. If not, you can simplify the equation from Step 3 and set it equal to zero and solve for the x-intercepts. It may be useful to make a sign chart.

STEP 5: Find the derivative in Step 4, with respect to the independent variable and find all relative extrema within the restrictions.

STEP 6: Test your relative extrema and you endpoints. Answer the question being asked.

Example 1

You have a piece of cardboard that is 25 in. by 20 in. Create a box (without at top) that would hold the most paper. What size square should be cut out? A calculator can be used

Example 2

Find the radius and height of the right circular cylinder of largest volume that can be inscribed in the cone if the height of the cone is 10 in. and its radius is 6 in.

Example 3

A 6 oz. aluminum can of Friskies cat food contains a volume of 14.5 in^3**.** How should it be constructed so the aluminum used to make the can is a minimum?

Example 4

Bill Ding plans to build a new hardware store. He buys a rectangular lot that is 50 ft. by 200 ft. the 50-foot dimension being along the street. The store is to have an area of 4000 square feet. Construction cost $100 per linear foot for the part of the store along the street and only $80 per linear foot for the parts along the sides and back. To what dimensions should Bill build the store in order to minimize the construction costs?