3.7 Optimization

OBJ: Solve applied minimum and maximum problems

Strategy

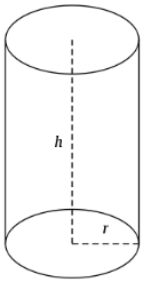
1. Sketch
2. Find the objective function to be optimized in terms of the variables
3. If necessary find a secondary equation to be solved for the independent variable (get the objective function to one variable)
4. Differentiate the objective function and set =0.
5. Find the critical numbers and endpoints.
6. Use 2nd derivative test or sign chart to find the value you need.
7. Write answer in terms of the problem

Finding Maximum Volume (the box problem)

A manufacturer wants to design an open box having a square base and a surface area of 108 square inches. What dimensions will produce a box with maximum volume?

Minimize surface area.

You need to make a one liter can shaped like a right circular cylinder. What dimensions will use the least amount of material? Assume you cannot change the thickness of the material used. Hint: 1 liter =1000cm^3



An endpoint problem:
Four feet of wire is used to form a square and a circle. How much of the wire should be used for the square and how much for the circle to enclose the maximum total area?

Minimum distance: Find the point on the graph that is closest to the given point. (0,2)

$y=4-x^2$

You try: A rectangle has its base on the x-axis and its two upper vertices on the parabola $y=12-x^2$. What is the largest area the rectangle can have and what are its dimensions?