

4.7 Optimization Problems

Starting from an example: Maximize Area

Starting from an example: Maximize Area
Strategy for Solving Optimization Problems
Example 1. Minimize a product
Example 2. Cost Minimization
Example 3. Design a can
Example 4 Design a box
Example 5 Inscribed Rectangle
Example 6 Maximize Revenue A farmer has 2400ft of fencing and want to fence off a rectangular field that boarders a straight river. He needs no fence along the river. What are the dimensions of the field that has largest area?

Strategy for Solving Optimization Problems

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Example 6 Maximize Revenue 1. Understand the problem.

2. Set up objective function for the quantity we want to maximize or minimize.

3. Find the domain of the function and the constraint for the variables.

4. Re-write the objective as function of one variable.

5. Locate extrema through f'(x) and f''(x).

6. Interpret the Solution.

Example 1. Minimize a product

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Find two numbers whose difference is 100 and whose product is a minimum.

Example 2. Cost Minimization

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Example 6 Maximize Revenue A rectangular garden of area 8,400 square feet is to be fenced off and then divided into 3 regions by 2 parallel fences across the interior of the garden. The fencing for the outside costs \$9 per running foot, while that the interior dividing fence costs \$12 per running foot. Let x be the length of the interior fences and y be the other dimension. Find x and y to minimize the cost.

Example 3. Design a can

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Example 6 Maximize Revenue A cylindrical can is to be made to hold 1L $(1,000 \ cm^3)$ of oil. Find the dimensions that will minimize the cost of metal to manufacture the can.

Example 4 Design a box

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Example 6 Maximize Revenue A box with a square base and open top must have a volume of $32,000 in^3$. Find the dimensions of the box to minimize the amount of materials used.

Example 5 Inscribed Rectangle

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Find the area of the largest rectangle that can be inscribed in a semicircle of radius 1.

Example 6 Maximize Revenue

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Example 6 Maximize Revenue Suppose that 20,000 fans will go to a ball game when the price of a ticket is \$14.00, and that 500 fewer fans will go for each \$1.00 increase in ticket price. What should be the ticket price in order to maximize the revenue?