Unit 2: Derivatives
Part 4

Bionic Who

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1 Problem 1

Use Lagrange multipliers to find the maximum and minimum values of the function $f(x, y) = x^2 + 2y^2$ subject to the constraint $x^2 + y^2 = 1$.

2 Problem 2

Find the dimensions of the rectangular box with largest volume that can be inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.

3 Problem 3

Find the points on the curve $xy = 1$ that are closest to the point $(2, 0)$.

4 Problem 4

A company manufactures two products. The demand functions for these products are given by $p = 60 - x$ and $q = 50 - y$, where p and q are the prices per unit (in dollars), and x and y are the quantities produced (in units). The joint cost function is $C(x, y) = xy + 20$. Use Lagrange multipliers to find the values of x and y that maximize the company's profit.