

Math 233 Warm Up Problems

October 2, 2009

1. Find the extrema of $f(x, y, z) = x^2 + y^2 + z^2$ subject to $x + 3y - 2z = 12$.
 - (a) Set up the equations required by the method of Lagrange multipliers.
 - (b) Solve the equations
 - (c) Analyze the critical points
2. Using Lagrange multipliers, find the extrema of $f(x, y, z) = 4x - 2y + 3z$ subject to $2x^2 + y^2 - 3z = 0$.
3. Using Lagrange multipliers, find the minimal distance from the origin to the plane $x + 3y - 2z = 4$.
4. Find the maximum and minimum values of $f(x, y, z)$ subject to the constraint $x + y + z = 1$. Assume that $x, y, z \geq 0$.
5. A rectangular box whose edges are parallel to the coordinate axes is inscribed in the ellipsoid $36x^2 + 4y^2 + 9z^2 = 36$. Find the maximum possible volume for such a box.
6. Using Lagrange multipliers, find the minimal distance from the origin to the surface $x^2y - z^2 + 9 = 0$.

Lecture Problems

7. Find the max/min of $f(x, y, z) = 4y - 2z$ subject to $2x - y - z = 2$ and $x^2 + y^2 = 1$.
8. Find the maximum and minimum of $f(x, y, z) = x + 2y + 3z$ on the intersection of the cylinder $x^2 + y^2 = 2$ and the plane $y + z = 1$.