

21-256 Homework 7

Updated Thursday 19th June 2014

Due Monday 23rd June 2014

Use the method of Lagrange multipliers to solve the following problems.

1. Maximize e^{xy} subject to $x^3 + y^3 = 16$.
2. Minimize $x^2 + y^2 + z^2$ subject to $x + y + z = 12$.
3. By using Lagrange multipliers on the boundary, find the global maximum of the function $f(x, y) = 2x^2 + 3y^2 - 4x - 5$ on the compact set $x^2 + y^2 \leq 16$.
4. Minimize xyz subject to $x^2 + 2y^2 + 3z^2 = 6$.
[Hint: the minimum value occurs when each of x , y and z is negative.]
5. Maximize $x^2 + y^2 + z^2$ subject to $x^4 + y^4 + z^4 = 1$.
[Hint: the maximum value occurs when each of x , y and z is nonzero.]
6. Question removed.
7. Find the point on the line of intersection of the planes $x - z = 3$ and $x + 2y + z = 1$ which is closest to the point $(-2, 1, 1)$.
8. Minimize $x^2 + 2y^2 + 4z^2$ subject to $2x + 2y + z = 8$.
9. Maximize $5x + 3y - x^2 - y^2$ subject to $3x + 2y \leq 9$ and $x + 2y \leq 6$.
10. By using a Lagrangian with a slack variable, find the global maximum of the function $f(x, y) = 2x^2 + 3y^2 - 4x - 5$ on the compact set $x^2 + y^2 \leq 16$.

10 points will be given for submitting your homework on time.