

MATH 134A+105A+110A Review: Lagrange Multiplier Method

1. Find the maximum and minimum values of $f(x, y) = 81x^2 + y^2$ subject to the constraint $4x^2 + y^2 = 9$.

Solution: Using the Lagrange Multiplier Method, the candidate points are $(-\frac{3}{2}, 0)$, $(\frac{3}{2}, 0)$, $(0, -3)$, $(0, 3)$, and their f -values are $\frac{729}{4}$, $\frac{729}{4}$, 9, 9, respectively. Therefore the maximum value is $\frac{729}{4} = 182.25$ and the minimum value is 9.

2. Find the maximum and minimum values of $f(x, y) = 8x^2 - 2y$ subject to the constraint $x^2 + y^2 = 1$.

Solution: Using the Lagrange Multiplier Method, the candidate points are $(-\frac{3\sqrt{7}}{8}, -\frac{1}{8})$, $(\frac{3\sqrt{7}}{8}, -\frac{1}{8})$, $(0, -1)$, $(0, 1)$, and their f -values are $\frac{65}{8}$, $\frac{65}{8}$, 2, -2, respectively. Therefore the maximum value is $\frac{65}{8} = 8.125$ and the minimum value is -2.