

EXERCISES #19

LAGRANGE MULTIPLIERS II: MULTIPLE CONSTRAINTS

Exercise 1. Find the boundary of the region, and divide it naturally into parts.

- (1) $\{(x, y) \mid 0 \leq x + y \leq 1\}$
- (2) $\{(x, y) \mid x^2 + 4y^2 \leq 4, x \geq 1\}$
- (3) $\{(x, y) \mid x + 2y^2 \leq 0, x + y \leq -1\}$
- (4) $\{(x, y) \mid 0 \leq x \leq 2, 0 \leq y \leq 2\}$
- (5) $\{(x, y, z) \mid x^2 + y^2 + z^2 \leq 1, x + y \leq 1, x \geq \frac{1}{2}\}$
- (6) $\{(x, y, z) \mid x^2 + y^2 = z^2, x + y \geq 1, z \leq 5\}$

Exercise 2. Determine whether there is a global maximum or a global minimum of a function f on a region D , and if they exist, find the values.

- (1) $f(x, y, z) = z$ on $D = \{(x, y, z) \mid x^2 + y^2 + z^2 = 1, x + y - z = 0\}$
- (2) $f(x, y, z) = x^2 + y^2$ on $D = \{(x, y, z) \mid x^2 + y^2 + z^2 = 50, x - z = 0\}$