

Exercises 4

(To be completed before 08.10.01)

1. Minimize $f(x, y) = (x + y)^2 + 4(x - y)^2$ by using the conjugate gradient method, starting from $(x_0, y_0) = (-5, -3)$.
2. Minimize $f(x, y) = x^2 + y^2$ subject to the constraint that $u(x, y) = (x + y)^2 + 4(x - y)^2 - 1 = 0$ by using the Lagrange multiplier method. Describe also how the problem can be solved by introducing a soft constraint.
3. The entropy $S[p]$ of a discrete probability distribution p_i is defined as

$$S[p] = -\langle \ln p \rangle = -\sum_i p_i \ln p_i .$$

Assign an energy E_i to each state i . Find the normalized distribution p_i that maximizes the entropy for a given average energy

$$\langle E \rangle = \sum_i E_i p_i = \bar{E} .$$