MAST30013 – Techniques in Operations Research

Semester 1, 2021

Tutorial 8

Consider the following nonlinear program

$$\begin{aligned} \min \quad & -x_1 x_2 \\ \text{s.t.} \quad & 4x_1 + x_2 \leq 8 \\ & x_1, x_2 \geq 0. \end{aligned}$$

(a) Write down the KKT conditions and find all stationary points together with their corresponding Lagrange multipliers.

(b) Check that one of the constraint qualifications holds.

(c) At each stationary point, identify the active constraints, write down the critical cone, and check that one of the second-order conditions holds. Can you deduce any local minima?

(d) Sketch the feasible region, lines of constant objective function, and the stationary points you found.