GRA 6035 Mathematics

Problems for Lecture 8

Key problems

Problem 1.
Use the SOC to show that the given point is a solution of the constrained optimization problem:
a) $(x^*, y^*) = (1, 1)$ is a minimum for: $\min f(x, y) = x^2 + y^2$ when $xy = 1$
b) $(x^*, y^*, z^*) = (2, 0, 0)$ is a minimum for: $\min f(x, y, z) = x^2 + y^2 + z^2$ when $3x^2 + 2y^2 + 2z^2 \geq 12$

Problem 2.
Determine if there are any admissible points such that the NDCQ fails when the constraints are given by:
a) $xyz = 1$ *b*) $3x^2 + 3y^2 + 8z^2 \geq 1$ *c*) $x^3 + y^3 + z^3 = 0$ *d*) $xy - zw = 1$ and $x + y + z + w = 4$

Problem 3.
Solve the constrained optimization problems:
a) $\max f(x, y, z) = 2 - x^2 + 4xy - 5y^2 + 2yz - 2z^2$ when $3x - 2y + z = 10$
b) $\max f(x, y, z, w) = xz + yw$ when $x^2 + y^2 \leq 1$ and $4z^2 + 9w^2 \leq 36$

Problems from the Digital Workbook

Exercise problems	8.1 - 8.9 (full solutions in the workbook)
Exam problems	8.10 - 8.13 (full solutions in the workbook)

Answers to key problems

Problem 2.
a) None b) None c) $(x, y, z) = (0, 0, 0)$ d) None

Problem 3.
a) $f_{\max} = 0$ b) $f_{\max} = 3$