Queen Mary
University of London

MTH5114 Linear Programming and Game Theory, Spring 2024

Week 9 Coursework Questions

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These exercises should be completed individually and submitted (together with those of weeks 8 and 10) via the course QMPlus page by **9am on Tuesday, 09 April**.

Make sure you clearly write your **name** and **student ID** number at the top of your submission:.

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1. For the following linear program,

$$\begin{aligned} \text{maximize} \quad & 7x_1 + 12x_2 + 9x_3 \\ \text{subject to} \quad & x_1 + 3x_2 + 3x_3 \leq 4, \\ & 2x_1 + 3x_2 + 2x_3 \leq 5, \\ & 2x_1 + 4x_2 + 3x_3 \leq 7, \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

   determine whether $\mathbf{x}^\mathsf{T} = (\frac{3}{2}, \frac{1}{3}, \frac{1}{2})$ is an optimal solution using the principle of complementary slackness.

2. For the following linear program

$$\begin{aligned} \text{maximize} \quad & x_1 + 8x_2 + 3x_3 \\ \text{subject to} \quad & 2x_1 + 8x_2 + 2x_3 \leq 4, \\ & 2x_1 + 4x_2 + 3x_3 \leq 4, \\ & x_1 + 2x_2 + x_3 \leq 1, \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

   determine whether $\mathbf{x}^\mathsf{T} = (0, \frac{1}{2}, 0)$ is an optimal solution using the principle of complementary slackness.