

MTH5114 Linear Programming and Game Theory, Spring 2024
Week 3 Coursework Questions Viresh Patel

These exercises should be completed individually and submitted (together with those of weeks 1 and 2) via the course QMPlus page by **9am on Monday, 19 February 2024**.

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

1. For each of the following linear programs:

- (1) Sketch the feasible region of the linear program and the direction of the objective function.
- (2) Use your sketch to find an optimal solution to the program. State the optimal solution and give the objective value for this solution. If an optimal solution does not exist, state why.

(a)

$$\begin{aligned} \text{maximize} \quad & -4x_1 + x_2 \\ \text{subject to} \quad & -x_1 + x_2 \leq 2, \\ & x_1 - 2x_2 \leq 4, \\ & x_1 + x_2 \geq 7, \\ & x_1, x_2 \geq 0 \end{aligned}$$

(b)

$$\begin{aligned} \text{maximize} \quad & \frac{1}{2}x_1 + 2x_2 \\ \text{subject to} \quad & -x_1 + 2x_2 \leq 4, \\ & \frac{3}{2}x_1 + 3x_2 \leq 12, \\ & x_1, x_2 \geq 0 \end{aligned}$$