Computing Methodologies - Optimisation

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1 LP Problem

$$\text{Maximise:} -x_1 + 10x_2$$

$$\text{subject to: } x_1 + x_2 \leq 10$$

$$-2x_1 + 3x_2 \geq 12$$

$$2x_1 + 3x_2 \geq 18$$

$$x_2 \leq 6$$

$$x_1 \geq 0$$

1.1 Solve Graphically

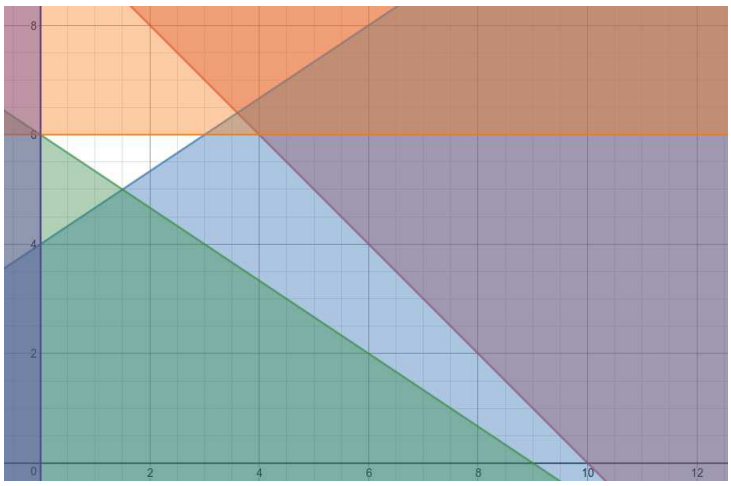

Figure 1: Graph of LP Problem

Results obtained: $(0, 6), (1.5, 5), (3, 6)$
These give solutions of 60, 48.5 and 57
Optimal solution is 60, from $x_1 = 0$ and $x_2 = 6$

1.2 Simplify

New system:

$$\text{Maximise:} -x_1 + 10x_2$$

$$\text{subject to: } x_2 \leq 6$$

$$x_1 \geq 0$$

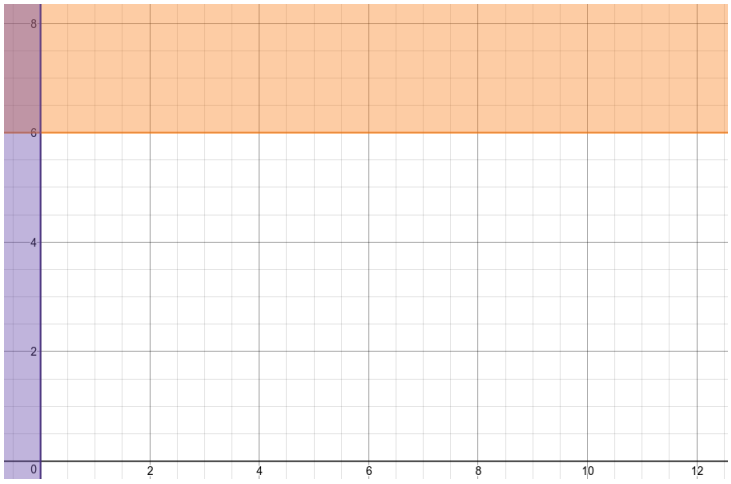

Figure 2: Graph of Simplified System

1.3 Standard Equational Form

$$\text{Maximise:} -x_1 + 10x_2$$

$$\text{subject to: } x_1 + x_2^+ - x_2^- + x_3 = 10$$

$$-2x_1 + 3x_2^+ - 3x_2^- - x_4 = 12$$

$$2x_1 + 3x_2^+ - 3x_2^- - x_5 = 18$$

$$x_2^+ - x_2^- + x_6 = 6$$

$$x_1, x_2^+, x_2^-, x_3, x_4, x_5, x_6 \geq 0$$