

Optimization Assignment-1

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Problem: Minimise and Maximise

$$Z = 5x + 10y$$

subjected to

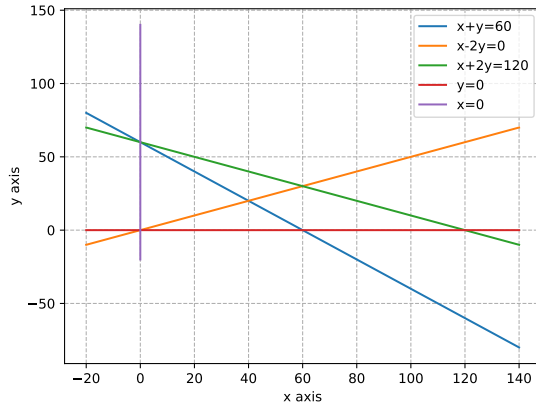
$$x + 2y \leq 120, x + y \geq 60, x - 2y \geq 0, x \geq 0, y \geq 0$$

$$x + y \geq 60$$

$$x - 2y \geq 60$$

$$x \geq 0, y \geq 0$$

all the above expressions can be expressed in vector form as



$$\begin{aligned} \min_{\mathbf{x}} \mathbf{Z} &= (5 \ 10) \mathbf{x} \\ \max_{\mathbf{x}} \mathbf{Z} &= (5 \ 10) \mathbf{x} \\ \begin{pmatrix} 1 & 1 \\ 1 & -2 \\ 1 & 0 \\ 0 & 1 \end{pmatrix} \mathbf{x} &\succeq \begin{pmatrix} 60 \\ 0 \\ 0 \\ 0 \end{pmatrix} \\ (1 \ 2) \mathbf{x} &\preceq (120) \end{aligned}$$

Solving above equations using cvxpy, we get

$$\min_{\mathbf{x}} Z = 300 \quad (3)$$

Solution

Problem can be formulated as,

$$\min_{\mathbf{x}} Z = (5x + 10y) \quad (1)$$

$$\max_{\mathbf{x}} Z = (5x + 10y) \quad (2)$$

$$x + 2y \leq 120$$

$$\mathbf{x} = \begin{pmatrix} 60 \\ 0 \end{pmatrix} \quad (4)$$

$$\max_{\mathbf{x}} Z = 600 \quad (5)$$

$$\mathbf{x} = \begin{pmatrix} 60 \\ 30 \end{pmatrix} \quad (6)$$