Linear Programming

1 12^{th} Maths - Chapter 12

This is Problem-1 from Exercise 12.1

1. Maximize

$$Z = 3x + 4y \tag{1}$$

subject to the constraints:

$$x + 4y \leq 4, \tag{2}$$

$$x \geq 0, y \geq 0 \tag{3}$$

Solution:

(a) Using cvxpy method: The given problem can be formulated as

$$\max_{\mathbf{x}} Z = \begin{pmatrix} 3 & 4 \end{pmatrix} \mathbf{x} \tag{4}$$

$$\begin{pmatrix} 1 & 4 \\ -1 & 0 \\ 0 & -1 \end{pmatrix} \mathbf{x} \preceq \begin{pmatrix} 4 \\ 0 \\ 0 \end{pmatrix} \tag{5}$$

Solving using cvxpy, we get

$$\max_{\mathbf{x}} Z = 12, \mathbf{x} = \begin{pmatrix} 4 \\ 0 \end{pmatrix} \tag{6}$$

(b) Using Corner point method: The corner points of the inequalities are:

$$\mathbf{A} = \begin{pmatrix} 0 \\ 1 \end{pmatrix} \tag{7}$$

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{8}$$

$$\mathbf{x} = \begin{pmatrix} 4 \\ 0 \end{pmatrix} \tag{9}$$

Substituting above values of corner points in Equation (1) to get the value of Z, as shown in the Table 2

From the table 2, it is clear that the optimum value and optimum point are similar to what we found in (6).

The relevant figure is as shown in 1

Corner Point	**Corresponding Z value**
A $\begin{pmatrix}0\\1\end{pmatrix}$	4
B $\begin{pmatrix}0\\0\end{pmatrix}$	0
x $\begin{pmatrix}4\\0\end{pmatrix}$	12

Table 2

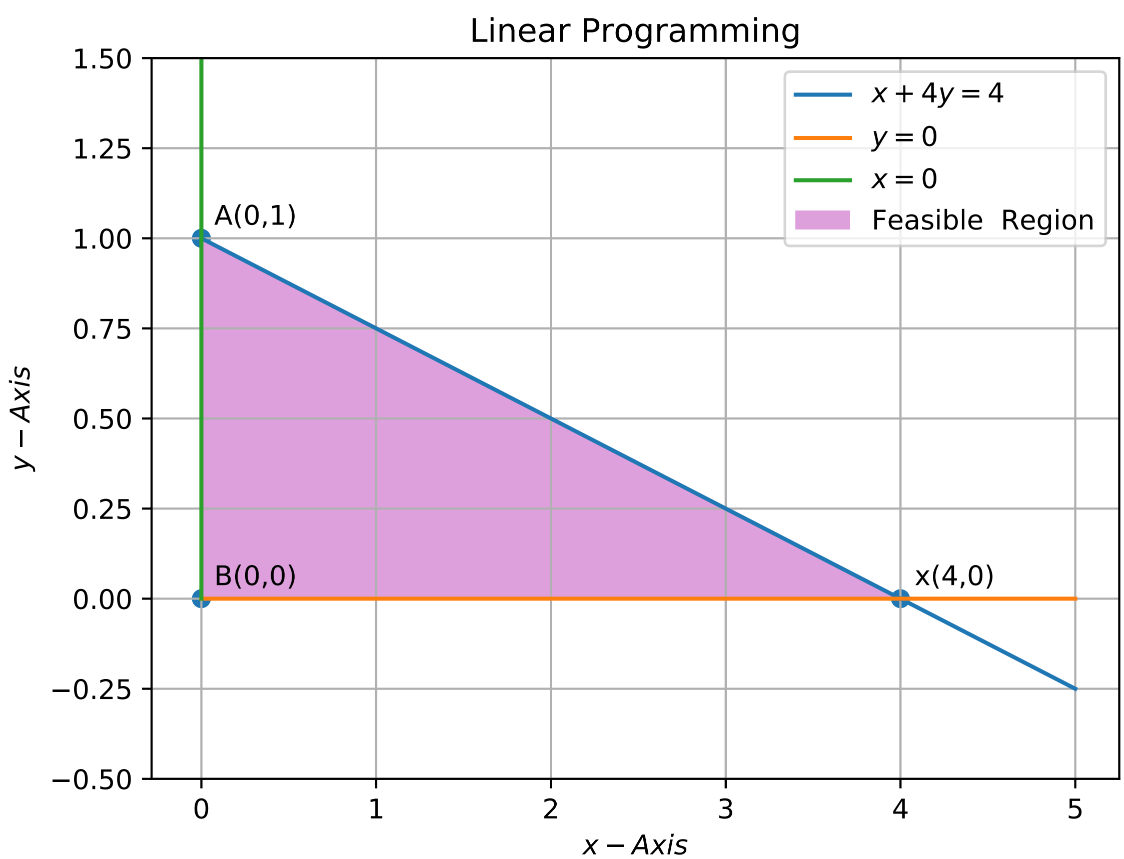

Figure 1