Assignment 5

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1) Minimise $Z = -3x + 4y$
subject to $x+2y \leq 8, 3x+2y \leq 12, x \geq 0, y \geq 0$.
Solution:
   a) Using cvxpy method: The given problem can be formulated as

$$\min_{\mathbf{x}} Z = \begin{pmatrix} -3 & 4 \end{pmatrix} \mathbf{x} \tag{0.0.1}$$

$$\text{s.t.} \quad \mathbf{A}\mathbf{x} \leq B \tag{0.0.2}$$

where

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 2 \\ -1 & 0 \\ 0 & -1 \end{pmatrix} \tag{0.0.3}$$

$$B = \begin{pmatrix} 8 \\ 12 \\ 0 \\ 0 \end{pmatrix} \tag{0.0.4}$$

By solving using cvxpy, we get

$$\min_{\mathbf{x}} Z = -12 \tag{0.0.5}$$

$$\mathbf{x} = \begin{pmatrix} 4 \\ 0 \end{pmatrix} \tag{0.0.6}$$

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

$$\mathbf{P} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{0.0.7}$$

$$\mathbf{Q} = \begin{pmatrix} 0 \\ 4 \end{pmatrix} \tag{0.0.8}$$

$$\mathbf{R} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \tag{0.0.9}$$

$$\mathbf{S} = \begin{pmatrix} 4 \\ 0 \end{pmatrix} \tag{0.0.10}$$

We have

$$Z = -3x + 4y \tag{0.0.11}$$

Substituting above values of corner points in Equation (0.0.11) to get the value of Z, as shown in the table 1 From the table 1, the

Corner Point	**Corresponding Z value**
$\mathbf{P}\begin{pmatrix} 0 \\ 0 \end{pmatrix}$	0
$\mathbf{Q}\begin{pmatrix} 0 \\ 4 \end{pmatrix}$	16
$\mathbf{R}\begin{pmatrix} 2 \\ 3 \end{pmatrix}$	6
$\mathbf{S}\begin{pmatrix} 4 \\ 0 \end{pmatrix}$	-12

TABLE 1

optimum point and optimum value are

$$\mathbf{S} = \begin{pmatrix} 4 \\ 0 \end{pmatrix} \tag{0.0.12}$$

$$\min Z = -12 \tag{0.0.13}$$

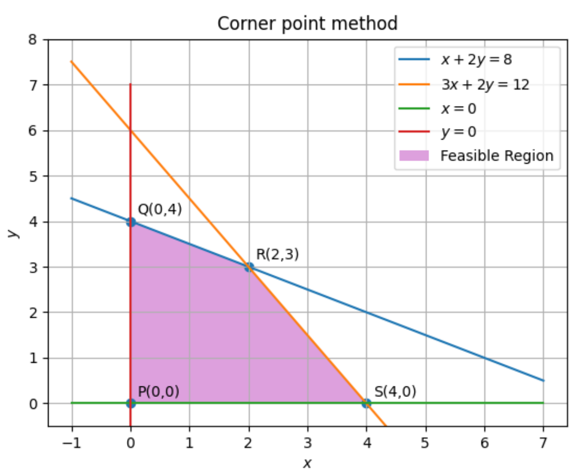

Fig. 1: Graph