EXERCÍCIO 1

$(Ans. x_1 = 4, x_2 = 2;\ Z_{max} = 10)$

EXERCÍCIO 2

$(Ans. x_1 = 2, x_2 = 0;\ Z_{min} = -2)$

EXERCÍCIO 3

$(Ans. Multiple\ optimal\ solutions;\ Z_{max} = 4)$

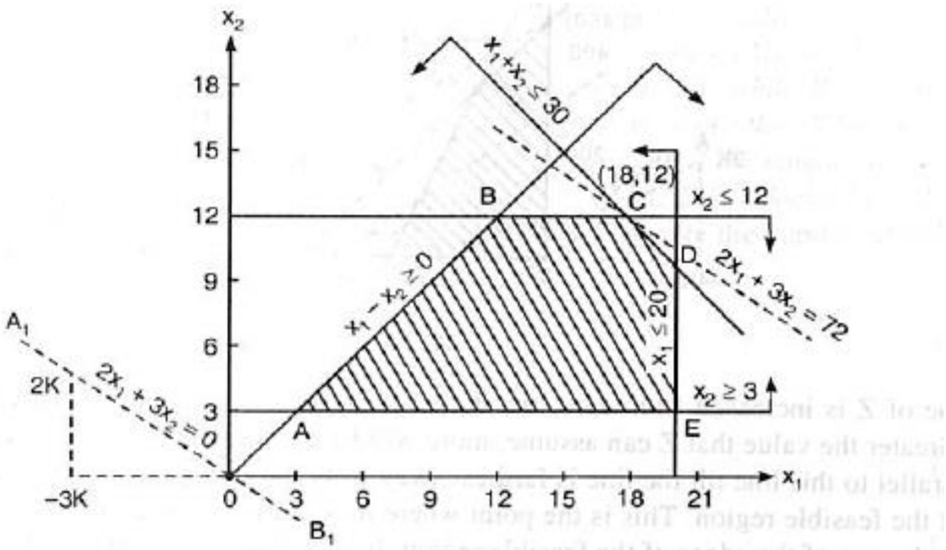
EXERCÍCIO 4

$(Ans. Unbounded\ solution)$

EXERCÍCIO 5

$(Ans. Feasible\ solution\ does\ not\ exist)$

EXERCÍCIO 6



$x_1 = 18$, $x_2 = 12$, $Z_{max} = 72$.

EXERCÍCIO 7

Formulation of Linear Programming Model. Let the number of parts I and II to be manufactured per week be x_1 and x_2 respectively.

Objective is to maximize the profit.

$$\text{i.e., maximize } Z = 40x_1 + 100x_2, \quad \dots (2.7)$$

$$\text{where } x_1, x_2 \geq 0. \quad \dots (2.8)$$

Constraints are on the time available on each machine.

$$\left.\begin{array}{ll} \text{Thus for lathes,} & 12x_1 + 6x_2 \leq 3{,}000, \\ \text{for milling machines,} & 4x_1 + 10x_2 \leq 2{,}000, \\ \text{and for grinding machines,} & 2x_1 + 3x_2 \leq 900. \end{array}\right\} \quad \dots (2.9)$$

Thus the problem is to determine the values of x_1 and x_2 which meet the non-negativity conditions (2.8), satisfy the constraints (2.9) and maximize equation (2.7).

Solution of L.P. Model. The solution space satisfying the constraints (2.9) and meeting the non-negativity conditions (2.8) is shown shaded in Fig. 2.14. Note that the constraint $2x_1 + 3x_2 \leq 900$ does not affect the solution space and is thus a redundant constraint.

The four vertices of the convex set OABC are O(0, 0), A(0, 200), B(187.5, 125), C(250, 0).

Values of the objective function $Z = 40x_1 + 100x_2$ at these vertices are

Z(O) = 0, Z(A) = 20,000, Z(B) = 20,000, Z(C) = 10,000.

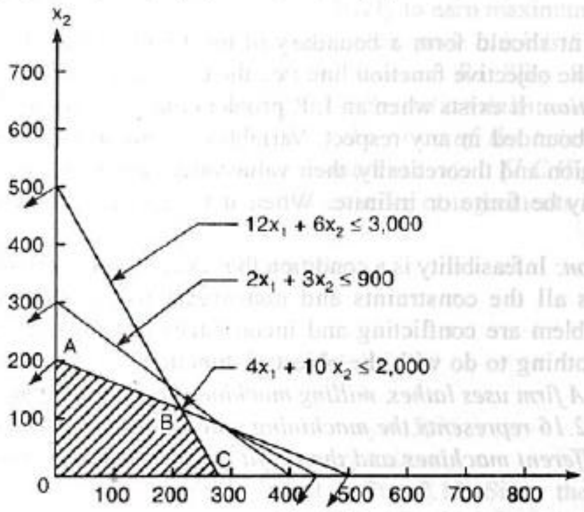


Fig. 2.14

Thus maximum value of Z occurs at two vertices A and B of the convex shaded region OABC.