EXERCÍCIO 1

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

EXERCÍCIO 2

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

EXERCÍCIO 3

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

EXERCÍCIO 4

(Ans. Unbounded solution)

EXERCÍCIO 5

(Ans. Feasible solution does not exist)

EXERCÍCIO 6

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

\[ i.e., \text{maximize } Z = 40x_1 + 100x_2, \]

where \( x_1, x_2 \geq 0 \).

Constraints are on the time available on each machine.

Thus for lathes,

\[ 12x_1 + 6x_2 \leq 3,000, \]

for milling machines,

\[ 4x_1 + 10x_2 \leq 2,000, \]

and for grinding machines,

\[ 2x_1 + 3x_2 \leq 900. \]

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

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

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