Chapter 2

Geometric Linear Programming

Linear programming is the problem of finding maximum or minimum value of a linear function of unknowns subject to constraints expressed as linear inequalities.

Geometric linear programming means finding the solution of a linear programming problem by graphing inequalities.

Polyhedral set. A set in the plane is a polyhedral set if the boundary of the set is formed by straight lines and the boundary lines are included in the set. (we say set is closed)

Theorem: For a given function \( f = ax + by \), the maximum or minimum (if they exist) values of the function \( f \) occur on a corner point of a closed polyhedral set.

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Q19. Let \( x = \text{# of acres of can}, y = \text{# of acres of cotton} \)

Objective function: \( P = 60x + 90y \)

Constraints: \( x \geq 0, y \geq 0 \)

Storage constraint: \( 100x + 40y \leq 19200 \quad -l_1 (192, 0), (0, 480) \)

Expenses constraint: \( 5\alpha x + 15\alpha y \leq 20,000 \quad -l_2 (400, 0), (0, 200) \)

Land constraint: \( x + y \leq 320 \quad -l_3 (320, 0), (0, 320) \)
Note the lines have been drawn by finding x and y intercepts.

the corner points of the polyhedron are (0,0), (0,200), (140,130), and (192,0).

<table>
<thead>
<tr>
<th>Corner point</th>
<th>(0,0)</th>
<th>(0,200)</th>
<th>(140,130)</th>
<th>(192,0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit P = 60x + 90y</td>
<td>0</td>
<td>18000</td>
<td>20110</td>
<td>11520</td>
</tr>
</tbody>
</table>

Maximum profit occurs when # of acry of corn = 140 and # of acry of soy bean = 130. Maximum profit = $20,110.

Q. 21: X = dollars in stock A, Y = dollars in stock B

Objective equation T = 0.1x + 0.8y

Constraints: x ≥ 0, y ≥ 0, y ≤ 9000, x ≥ 6000

x + y ≤ 5000; y ≥ 2x

Sharon maximizes her profit when the invest

$3750 in stock A and $1250 in stock B.