Homework Optimize 2

Week 7

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Collaborators. ChatGPT (for LaTeX styling and grammar checking)

1 Simplex Method & Two-Phase Method

Problem 1. Use the simplex method to solve the following LP.

$$\begin{aligned} \max \quad & z = 3x_1 + 2x_2 \\ \text{subject to} \quad & x_1 + x_2 \leq 3 \\ & x_1 + 2x_2 \leq 5 \\ & 2x_1 + x_2 \leq 5 \\ & x_1, x_2 \geq 0 \end{aligned}$$

Solution. Coming Soon...

Problem 2. Determine whether each of the following LPs is degenerate or nondegenerate.

a)

$$\begin{aligned} \max \quad & z = 2x_1 + x_2 \\ \text{subject to} \quad & x_1 + x_2 \leq 4 \\ & x_1 + 2x_2 \leq 4 \\ & x_1, x_2 \geq 0 \end{aligned}$$

Solution. Coming Soon...

b)

$$\begin{aligned} \max \quad & z = 2x_1 + x_2 \\ \text{subject to} \quad & x_1 + x_2 \leq 4 \\ & x_1 + 2x_2 \leq 6 \\ & x_1, x_2 \geq 0 \end{aligned}$$

Solution. Coming Soon...

c)

$$\begin{aligned} \max \quad & z = 2x_1 + x_2 \\ \text{subject to} \quad & x_1 + x_2 \leq 4 \\ & x_1 + 2x_2 \leq 8 \\ & x_1, x_2 \geq 0 \end{aligned}$$

Solution. Coming Soon...

Problem 3. Use the two-phase method to solve the following LP.

$$\begin{aligned} \max \quad & z = 2x_1 + 3x_2 \\ \text{subject to} \quad & 3x_1 + x_2 \leq 14 \\ & x_1 - x_2 \geq 1 \\ & -x_1 + 3x_2 \leq 2 \\ & x_1, x_2 \geq 0 \end{aligned}$$

Solution. Coming Soon...

TO SUBMIT

Problem 4. Formulate the following problem into LP and solve it. You can use any method you want.

Hamtaro likes to eat sunflower seed. He wants to eat it as much as possible. There are two types of sunflower seed: the regular one and the low-fat one. A gram of regular sunflower seed contains 0.5g of fat, 0.2g of protein, and 0.1g of fiber. A gram of low-fat sunflower seed contains 0.3g of fat, 0.3g of protein, and 0.15g of fiber.

Hamtaro should get at most 11 grams of fat and at most 8 grams of protein per day. To be healthy, he should get at least 3 grams of fiber per day. Find the maximum possible total amount of sunflower seed he can eat in a day.

Solution. Coming Soon...