

Assignment
Optimization for Data Science: Fractal 2
Indian Institute of Technology Jodhpur

1. Consider the problem

$$\min 2x_1 - x_2 + 2x_3$$

subject to:

$$2x_1 + x_2 + x_3 = 4$$

$$x_1 + 2x_2 + x_4 = 5$$

$$x_1, x_2, x_3, x_4 \geq 0$$

Find all basic feasible solutions for this problem. Also find the optimal solution for the given problem.

2. Solve the following LPP using simplex method.

(i)

$$\max z = 3x_1 + 2x_2$$

Subject to:

$$2x_1 + x_2 \leq 6$$

$$x_1 + 2x_2 \leq 6$$

$$x_1, x_2 \geq 0$$

(ii)

$$\max x_1 + 2x_2 + 2x_3$$

subject to:

$$2x_1 + x_2 + x_3 \leq 6$$

$$x_2 + x_3 \leq 4$$

$$x_1, x_2, x_3 \geq 0$$

3. Solve

$$\max x^2 + y^2$$

subject to : $x + y - 1 = 0$, using the Lagrange multiplier method.

4. Solve the problem using a penalty function method

$$\min x^2 + (y - 2)^2$$

subject to $y = x + 1$.

5. Solve the problem using a suitable barrier function method

$$\min x^4 + y^2$$

subject to $x \geq 0, y \geq 0$.

6. Solve the problem using the Frank and Wolfe method

$$\min x^3 + y^3$$

subject to :

$$3x + y \leq 3$$

$$5x - 3y \leq 5$$

$$x, y \geq 0$$

Perform two iterations.

7. Solve the following LPP using Charne's M method:

$$\max z = 8x + 4y$$

subject to :

$$4x + 2y \leq 30$$

$$2x + 4y \geq 24$$

$$x, y \geq 0$$

8. Solve the following problem using Lagrange multiplier method.

$$\min x_1^2 + x_2^2 + 2x_3$$

subject to :

$$x_1 + x_2 + x_3 = 6$$

$$-x_1 + x_2 + x_3 = 4$$

Verify whether the point you got is a KKT point or not.

9. Consider the problem

$$\min 3x_1^2 + x_2^2 + 2x_3^2 + 2x_1 + 2x_2 + 2x_3$$

subject to $x_1^2 + x_2^2 + x_3^2 = 1$

Find the KKT points and the corresponding KKT multipliers.