Practice on non-linear programming 3

1. Find the optimal solution and its objective value for the following problem.

$$\begin{aligned} \min \quad & x_1^2 \\ \text{s.t.} \quad & x_1 \le -1 \end{aligned}$$

2. Find the optimal solution and its objective value for the following problem.

$$\begin{aligned} \min \quad & x_1^2 + x_2^2 + x_3^2 \\ \text{s.t.} \quad & x_1 + x_2 + x_3 \le 6 \\ & x_1 + 2x_2 + x_3 = 10 \end{aligned}$$

3. Find the optimal solution and its objective value for the following problem.

$$\begin{aligned} \min \quad & x_1^2 + x_2^2 \\ \text{s.t.} \quad & x_1 + 2x_2 = 4 \\ & x_1^2 + x_2^2 \le 5 \\ & x_1,\ x_2 \ge 0 \end{aligned}$$

4. Find the optimal solution and its objective value for the following problem.

$$\begin{aligned} \max \quad & \log(x_1 + 1) + x_2 \\ \text{s.t.} \quad & 2x_1 + x_2 \le 3 \\ & x_1^2 + x_2^2 = 9 \\ & 0 \le x_1 \le 5 \\ & 1 \le x_2 \le 4 \end{aligned}$$

5. Find the optimal solution and its objective value for the following problem.

$$\begin{aligned} \min \quad & x_1^2 + x_2^2 \\ \text{s.t.} \quad & x_1 + x_2 \ge 1 \\ & x_1^2 + x_2^2 \ge 1 \\ & 9x_1^2 + x_2^2 \ge 9 \\ & x_1^2 \ge x_2 \\ & x_2^2 \ge x_1 \\ & -50 \le x_1,\ x_2 \le 50 \end{aligned}$$

6. Find the optimal solution and its objective value for the following problem.

$$\begin{aligned} \min \quad & x_1 x_4 (x_1 + x_2 + x_3) + x_3 \\ \text{s.t.} \quad & x_1 x_2 x_3 x_4 \ge 25 \\ & x_1^2 + x_2^2 + x_3^2 + x_4^2 = 10 \\ & 1 \le x_1,\ x_2,\ x_3,\ x_4 \le 5 \end{aligned}$$