

Assignment-1

Lecturer: Wan-Lei Zhao

1. For what value of α is, the following matrix becomes positive definite?

$$A = \begin{bmatrix} 1 & \alpha & -1 \\ \alpha & 4 & 2 \\ -1 & 2 & 4 \end{bmatrix} \quad (1)$$

2. Solve the following problem graphically

(a) Maximize $f = 250x + 75y$, under the constraint

$$\begin{cases} 5x + y \leq 100 \\ x + y \leq 60 \\ x, y \geq 0 \end{cases} \quad (2)$$

(b) Maximize $f = 4x + y$, under the constraint

$$\begin{cases} x + y \leq 50 \\ 3x + y \leq 90 \\ x, y \geq 0 \end{cases} \quad (3)$$

3. A dietician wishes to mix two types of foods in such a way that vitamin contents of the mixture contain at least 8 units of vitamin A and 10 units of vitamin C. Food-I contains 2 units/kg of vitamin A and 1 unit/kg of vitamin C. Food-II contains 1 unit/kg of vitamin A and 2 units/kg of vitamin C. It costs \$5 per kg to purchase Food-I and \$7 per kg to purchase Food-II. Formulate this problem as a linear programming problem to minimize the cost of such a mixture.
4. There are two factories located one at place P and the other at place Q. From these locations, a certain commodity is to be delivered to each of the three depots situated at A, B and C. The weekly requirements

Tab. 1: Transportation Costs in Dollars

From/To	A	B	C
P	16	10	15
Q	10	12	10

of the depots are respectively 5, 5 and 4 units of the commodity while the production capacity of the factories at P and Q are respectively 8 and 6 units. The cost of transportation per unit is given in Table 1. Formulate this problem as a linear programming problem to minimize the cost of transportation.

- Requirements:

1. Submission due: 2025/Oct/5, 23:00pm
2. Organize your solutions (with detailed steps) into a PDF, \LaTeX editor¹ is recommended
3. Submit to lecwlzhao@163.com, email title “your-name + your student number”
4. PDF file name should be assignment1.studentnumber.pdf

¹ <https://www.tug.org/texlive/>