Home Assignment

Problem 1: A chemical manufacturing company sells three products and has found that the function that describes its cost of production is given by:

$$F = x_1^2 + x_2^2 + x_3^2 - 10x_1 - 6x_2 - 8x_3 \tag{1}$$

where x_1, x_2 and x_3 are the monthly production rates of each chemical in tonnes.

1. Determine, by hand calculations, the monthly production rates that minimize the cost function when there are *no constraints* on the variables. Also, report the value of the cost function at these production rates. Verify your answer in MATLAB.

2. Determine, by hand calculations, the monthly production rates that minimize the cost function when the following *equality constraints* are enforced:

$$\begin{aligned} 0.5x_3^2 + x_2 &= 3 \\ x_1 + 4x_2 + 5x_3 &= 34 \end{aligned} \tag{2}$$

   Also, report the value of the cost function at these production rates. Verify your answer in MATLAB

3. Write a program in MATLAB to determine the monthly production rates that minimize the cost function where the following *inequality constraints* are enforced:

$$\begin{aligned} x_1 &\geq 2 \\ 0.5x_3^2 + x_2 &\geq 3 \\ x_1 + 4x_2 + 5x_3 &\leq 34 \\ x_1 + 3x_2 + 2x_3 &\leq 29 \end{aligned} \tag{3}$$

   Also, report the value of the cost function at these production rates.