Assignment 3

A tool manufacturing company wants to make two products, allen wrenches (x_1) and bolt cutters (x_2). Both tools require construction in two different departments. Allen wrenches require 1 hour in the first department and 1.25 hours in the second department. Bolt cutters require 1 hour in the first department and 0.75 hours in the second department. Each department may work 200 hours per month. The maximum market demand for bolt cutters is 150 units monthly. The company makes a 4\$ profit on allen wrenches and 5\$ profit on bolt cutters. In addition to maximizing profit (f_1), the company's best client wants as many allen wrenches as possible (f_2).

a) Formulate the multi-objective optimization problem.

b) Using goal criterion method find the solution using any optimization routine (Matlab). Choose a normalized objective function

$$f(x) = \sum_{i=1}^{2} ((f_i^* - f_i(x))/f_i^*)^p \tag{1}$$

where $f^* = (950, 160)$ is the ideal solution vector. Use both values $p = 1$ and $p = 2$.

c) Draw the feasible decision variable space with the normalized objective function (for $p = 1, 2$) and corresponding optimal solutions. Draw also the objective space (f_1, f_2) with optimal solutions (for $p = 1, 2$) and the ideal point.