Assignment 2

Deadline: Friday, Oct. 20, 11:59 PM

Pareto dominance:

An objective vector $u = (u_1, \ldots, u_n)$ is said to dominate $v = (v_1, \ldots, v_n)$ (denoted by $u \prec v$) if and only if no component of v is smaller than the corresponding component of u and at least one component of u is strictly smaller, that is,

$$\forall i \in \{1, \ldots, n\} : \; u_i \leq v_i \; \wedge \; \exists i \in \{1, \ldots, n\} : \; u_i < v_i$$

It means for values of u and v, the lower value is desirable.

Please write an algorithm which gets two vectors u and v as inputs, and then finds the all non-dominated points (Pareto-front set) for the following four situations/assumptions:

(1) Low values for u and v are desirable.
(2) High values for u and v are desirable.
(3) Low values for u and high values for v are desirable.
(4) High values for u and low values for v are desirable.

(Example for case (2) --- u: midterm mark, v: final exam mark, students in Pareto-front set would be top students in the class).

A) You need to design and analysis the algorithm, including finding the Big-O time complexity.

B) You need to implement the algorithm and run it for four examples (each vector with 20 values). For each example, you need to plot the all 20 points and show the Pareto-front set for all four cases, (1)-(4).

As a PDF file, you need to submit your algorithm description in pseudo-code, Big-O analysis, code, four sample examples, plots and results.