Grader Output

ProblemSet1_S

100.00 / 100.00 points earned
8 / 8 autograded cells passed

Graded Cells

Cell 3 (cell-27ea82442fc8476

Passed | 28.57 / 28.57 points
View feedback

Cell 3 (cell-3520e78d700c653

Passed | 0 / 0 points
View feedback

Cell 6 (cell-580fc4f473d646d0

Passed | 28.57 / 28.57 points
View feedback

Cell 6 (cell-00b07f0c726e3a2

Passed | 0 / 0 points
View feedback

Instructions

> This assignment is to be completed and uploaded as a python3 notebook.

This problem set covers the following topics:

- Basics of algorithms: correctness and running time complexity.
- Time Complexity: O, big-Omega and big-Theta Notations.
- Proving Correctness of Algorithms through Inductive Invariants.
- Merge Sort: Proving Correctness.

Important Note

Although this is a programming assignment, we have asked you to work on the "design" and provided opportunities for you to analyze your solution and describe your design. **However, those parts will not be graded.** You are welcome to compare your answers against our solutions once you have completed the assignments. Our solutions are provided at the very end.

Cell 6 (cell-b9eb749c03f9e41

Passed | 0 / 0 points

View feedback

Cell 6 (cell-9ed6c57e3ae0a95

Passed | 0 / 0 points

View feedback

Cell 10 (cell-b4cf5a943c483a7

Passed | 42.86 / 42.86 points

View feedback

Cell 10 (cell-2721212ce41a53d

Passed | 0 / 0 points

View feedback

Problem 1: Find Crossover Indices.

You are given data that consists of points $(x_0, y_0), \ldots, (x_n, y_n)$, wherein $x_0 < x_1 < \ldots < x_n$, and $y_0 < y_1 \ldots < y_n$ as well.

Furthermore, it is given that $y_0 < x_0$ and $y_n > x_n$.

Find a "cross-over" index i between 0 and $n-1$ such that $y_i \leq x_i$ and $y_{i+1} > x_{i+1}$

Note that such an index must always exist (convince yourself of this fact before we proceed).

Example

i	0	1	2	3	4	5	6	7
x_i	0	2	4	5	6	7	8	10
y_i	-2	0	2	4	7	8	10	12

Your algorithm must find the index $i = 3$ as the crossover point.

On the other hand, consider the data

i	0	1	2	3	4	5	6	7
x_i	0	1	4	5	6	7	8	10
y_i	-2	1.5	2	4	7	8	10	12

We have two cross over points. Your algorithm may output either $i = 0$ or $i = 3$.