INTRODUCTION

A common problem in computational geometry is ordering a list of n-dimensional points that are arbitrarily but regularly sampled from an open curve. Consider the example in Figure 1 and that the list of regularly sampled 2D points on this curve are given as follows:

$$(x_1, y_1), (x_2, y_2), (x_3, y_3), (x_4, y_4), (x_5, y_5), (x_6, y_6), (x_7, y_7), (x_8, y_8).$$

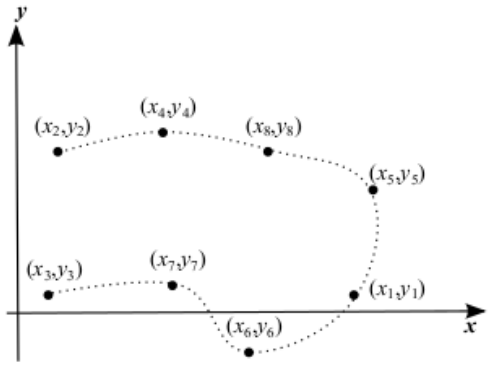

Figure 1: A set of points sampled regularly on an open curve.

The problem that we are interested in is ordering $\{(x_i, y_i)\}$ based on their positions on the curve such that two points that are adjacent to each other on the curve are placed next to each other in the ordered list. For the example in Figure 1, one possible ordering is:

$$(x_3, y_3), (x_7, y_7), (x_6, y_6), (x_1, y_1), (x_5, y_5), (x_8, y_8), (x_4, y_4), (x_2, y_2),$$

and another is:

$$(x_2, y_2), (x_4, y_4), (x_8, y_8), (x_5, y_5), (x_1, y_1), (x_6, y_6), (x_7, y_7), (x_3, y_3).$$

PROBLEM & SPECIFICATIONS

In this THE, we would like you to write a function named `order(L)` which gets a list of 2D points (which are also lists) and returns a possible ordering of the points.

While solving the THE, take the following into consideration:

- x_i and y_i are real numbers.
- The distance between two points $a = (x_i, y_i)$ and $b = (x_j, y_j)$ can be calculated as follows:

$$d(a, b) = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2}. \quad (1)$$

- The distance (Eqn. 1) between any two points (x_i, y_i) and (x_j, y_j) that are not adjacent to each other on the curve is going to be at least 1.5 times larger than the distance between any two adjacent points on the curve.
- "Regularly sampled" means that the distance (Eqn. 1) between any two adjacent points is constant for the given list of points.
- The curve is open; i.e., the distance between the end points of the curve is at least 1.5 times larger than the distance between any two adjacent points on the curve.
- The length of the list that function `order` will take is not limited.
- A simple ordering of the points based on the x or the y coordinates is insufficient.
- You are free to use recursion or iteration.
- You are not allowed to use external modules or libraries other than the math module.

EXAMPLE RUN

```
>>> R = order([[2.4492935982947064e-16, 4.0], [2.0000000000000004, 3.4641016151377544],
[4.0, 0.0], [-3.4641016151377539, 2.0000000000000013],
[-1.9999999999999991, 3.4641016151377548], [3.4641016151377548, 1.9999999999999998]])
```