Problem H: Half Plane Painting

- Time Limit: 2 sec

Problem Statement

You have a 2D plane that is initially entirely white. You can perform the following operation any number of times:

- Choose a line and the half-plane bounded by this line. Then, perform one of the following actions:
  - Paint the half-plane (excluding the boundary) black.
  - Paint the half-plane and the boundary white.

You are given the polygon P with N vertices, which is not necessarily convex. The vertices of P are given in counterclockwise order as $(x_1, y_1), (x_2, y_2), \ldots, (x_N, y_N)$, and the i-th edge of P connects vertex (x_i, y_i) to vertex $(x_{(i \bmod N)+1}, y_{(i \bmod N)+1})$.

Determine whether it is possible to use the aforementioned operations to paint only the interior of polygon P black, leaving everything else white.

Input

The input is given in the following format:

$$N$$
$$x_1 \ y_1$$
$$x_2 \ y_2$$
$$\vdots$$
$$x_N \ y_N$$

- $3 \le N \le 4{,}000$
- $-10^7 \le x_i, y_i \le 10^7 \quad (1 \le i \le N)$
- $(x_i, y_i) \ne (x_j, y_j) \quad (i \ne j)$
- The vertices of polygon P are given in counterclockwise order.
- The edges of polygon P do not share any points other than the vertices.
- Each internal angle of polygon P is not 180 degrees.
- All input values are integers.

Output

If it is possible to achieve the desired state with the operations, output `Yes`; otherwise, output `No`.

Sample Input 1	Sample Output 1
4 10 −5 2 −5 −7 6 −7 −8	Yes

Sample Input 2	Sample Output 2
12 17 1 19 3 12 10 19 17 17 19 10 12 3 19 1 17 8 10 1 3 3 1 10 8	No