

# Tangent Point Query

Time: 1 sec / Memory: 256 MB

## Problem Statement

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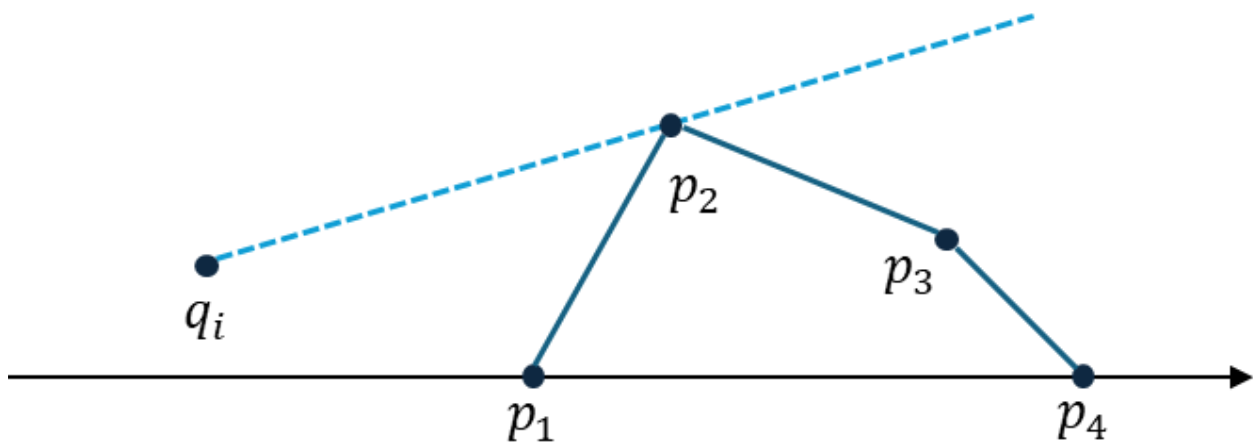
In this problem you are given an upper convex curve and a number of query points. Your goal is to report the tangent point of each query point at the convex curve.

The upper convex curve is represented by a sequence of  $n$  points  $p_1 = (x_1, y_1), p_2 = (x_2, y_2), \dots, p_n = (x_n, y_n)$  that starts and ends at the x-axis, i.e.,  $y_1 = y_n = 0$ .

Furthermore, the convex curve is at the first quadrant.

The query point  $q_1, \dots, q_m$  are at the second quadrant.

Please compute the tangent points of the query points at the convex curve.



**Hint:** You may want to use the **cross-product** of 2D-vectors to design a test for tangent points.

## Input

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The first line contains two integers  $n, m$ .

Then there are  $n$  lines, each of which contains two integers  $x_i$  and  $y_i$ , the coordinates of the  $p_i$ .

After that, there are  $m$  lines, one for each query point. Each of the  $m$  lines contains two integers  $x$  and  $y$ , the coordinate of the query points.

It is guaranteed that  $p_1, \dots, p_n$  form an upper convex curve that starts and ends at the x-axis.

You may also assume the following.

- $3 \leq n \leq 10^5$
- $1 \leq m \leq 10^5$
- $0 \leq x_i, y_i, y \leq 10^8$
- $-10^5 \leq x < 0$
- $x_1, x_2, \dots, x_n$  is non-decreasing.
- $y_1 = y_n = 0$

## Output

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For each query point, print the index of the tangent points at the convex curve of the query points. If there are multiple solutions, print the one with the smallest index.

## Constraints

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- $3 \leq n \leq 10^5$
- $1 \leq m \leq 10^5$
- $0 \leq x_i, y_i, y \leq 10^8$
- $-10^5 \leq x < 0$
- $x_1, x_2, \dots, x_n$  is non-decreasing.
- $y_1 = y_n = 0$

## Example

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Input1

```
3 4
0 0
0 10
10 0
-1 0
-1 5
-1 11
-1 12
```

Output1:

2  
2  
2  
3

Input2:

4 7  
0 0  
0 10  
100 10  
100 0  
-1 0  
-10 0  
-100000 0  
-100000 100000  
-10 10  
-11 11  
-1 11

Output2:

2  
2  
2  
3  
2  
3  
3