Polynomial Calculator

Time Limit: 1.5s **Memory Limit:** 256M

You are given a polynomial $p(x) = a_0 + a_1x + a_2x^2 + \ldots + a_mx^m$ of degree m. In addition, you will have n real numbers $x_1, \ldots, x_n$. You need to calculate $p(x_i)$ for each $i \in \{1, ..n\}$.

However, evaluating a polynomial gets more complex as its degree increases. Therefore you must use an approximation whenever it is possible.

To approximate $p(x)$, you will compute $T(x) = p(x_0) + p'(x_0) \cdot (x - x_0) + \frac{p''(x_0)}{2} \cdot (x - x_0)^2$, where $|x - x_0| < \epsilon = 10^{-3}$. x_0 can be any of the previous queries, for which you already directly computed the polynomial.

Input

The first line contains two integers, m and n.

The next line contains $m + 1$ real numbers, which are polynomial coefficients. The first one is a_0 and the last one is a_m.

The last line contains n real numbers which correspond to query points where $p(x)$ will be evaluated.

- $0 \leq m \leq 5 \cdot 10^4$
- $1 \leq n \leq 5 \cdot 10^4$
- $a_m \neq 0$
- $|a_i| \leq 100$
- $|x_i| < 0.5$
- a_i and x_i will not be more precise than 10^{-4}

Output

Print the answer of each query with spaces in-between on the same single line and in the given order. Your answer will be considered correct if its absolute or relative error does not exceed 10^{-6}. Formally, let your answer be a and the jury's answer b. Your answer will be considered correct if $\frac{|a-b|}{max(1,|b|)} \leq 10^{-6}$.

Example

Input 1:

```
2 3
1 0.5 3
0 0.1 0.0001
```

Output 1:

```
1 1.08 1.00005
```

Input 2:

```
2 3
1 1 1
0.1 0.1001 0.0999
```

Output 2:

```
1.11 1.11012 1.10988
```

Input 3:

```
2 3
1 1 1
0.1 0.1005 0.101
```

Output 3:

```
1.11 1.1106 1.111201
```

Explanation

Input 1: $p(x) = 1 + 0.5x + 3x^2$

First two queries $p(0)$ and $p(0.1)$ are computed directly. We can approximate $p(0.0001) \approx T(0.0001) = p(0) + p'(0) \cdot (0.0001 - 0) + \frac{p''(0)}{2} \cdot (0.0001 - 0)^2$.

Input 2: The first query is directly calculated. The second and third ones are approximated.

Input 3: The first query is directly calculated. The second one is approximated. The third one is directly calculated.