HW-1   CSL2020 (Dec 2020)

Note: Submit only one C file. Input would be read from terminal (i.e. stdin) and not from any file. The submission is to be made on Google classroom.

Please make yourself aware of the anti-plagiarism policy as described in the class. Any code copying may lead to grade reduction or F grade, as already announced.

File name:
The submitted file name should be "nnnn_hw1.c" where nnnn is your entry number (e.g. b19cse999). We will follow the same naming convention throughout this course. There could be multiple questions in future homeworks. In that case, you should use nnnn_1_hw2.c, nnnn_2_hw2.c etc. for questions 1, 2, ... in homework 2.

Evaluation:
Will be done by some test cases. Example test cases are described in the question.

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Using linked list, write a program to add, subtract and evaluate polynomials: P1(x), P2(x), P3(x) and P4(x) where P1(x) and P2(x) are input polynomials and P3(x) = P1(x)+P2(x) and P4(x)=P1(x)-P2(x). Each node in the linked list correspond to a term in the polynomial. So, in your node structure - you may keep two data components – integers pow and coeff; and one pointer to the next node.

Input Format:
First line mentions K i.e. the number of test cases. Then there are three lines for each test case, In the first two lines of a test case, First number indicate the highest degree of polynomials N and then there are N+1 integers which are the coefficients of polynomial terms in descending order.
In the third (and last line) of a test case, there is one integer i.e. value of x for which you need to evaluate the polynomials. (Constraints: $0 \leq K \leq 50$, $0 \leq N \leq 9$, $-2 \leq x \leq 2$, and Input coefficient terms would be between -100 to +100; Assume you can safely do calculations for each polynomial term without worrying about underflow/overflow issues).

<u>**Sample Input 1:**</u>
1
7 1 0 0 0 10 -3 0 1
3 4 0 0 -2
2

Explanation of Input Format (Considering 2ⁿᵈ Polynomial mentioned above)

3	4	0	0	-2
Highest degree of polynomial	Coefficient of x^3	Coeff of x^2	Coeff of x^1	Coeff of x^0

As per above format: 7 1 0 0 0 10 -3 0 1 ===> $x^7 + 10x^3 - 3x^2 + 1$

                   3 4 0 0 2   ===> $4x^3 - 2$

                   2   ===> value of x should be in range of -2 to 2.

> **Sample Output 1:**
> P1(x) : 1x^7 + 10x^3 - 3x^2 + 1
> P2(x) : 4x^3 - 2
> P3(x) = P1(x) + P2(x) : 1x^7 + 14x^3 - 3x^2 - 1
> P4(x) = P1(x) - P2(x) : 1x^7 + 6x^3 - 3x^2 + 3
> P1(2) = 197
> P2(2) = 30
> P3(2) = 227
> P4(2) = 167

Note: There is a single space before and after =, +, -, and : in the output.

Explanation of Output Format:

1x^7 + 14x^3 - 3x^2 - 1 ====> $f_1(x)+f_2(x)$
1x^7 + 6x^3 - 3x^2 + 3 ====> $f_1(x) - f_2(x)$
197 30 227 167   ====> $f_1(2)$ $f_2(2)$ $(f_1(2) + f_1(2))$ $(f_1(2) - f_2(2))$

Note that there should be **NO** nodes in the linked list for the polynomial terms having 0 coefficient value. In the above example, the polynomials f1 and f2 were to be represented using 4 and 2 nodes in the linked list, respectively.

Sample Input 2	**Sample Output 2**
3	P1(x) : 1x^7 + 10x^3 - 3x^2 + 1
7 1 0 0 0 10 -3 0 1	P2(x) : 4x^3 - 2
3 4 0 0 -2	P3(x) = P1(x) + P2(x) : 1x^7 + 14x^3 - 3x^2 - 1
2	P4(x) = P1(x) - P2(x) : 1x^7 + 6x^3 - 3x^2 + 3
7 1 0 0 0 10 -3 0 1	P1(2) = 197
3 4 0 0 -2	P2(2) = 30
1	P3(2) = 227
7 1 0 0 0 10 -3 0 1	P4(2) = 167
7 1 0 0 0 10 -3 0 1	P1(x) : 1x^7 + 10x^3 - 3x^2 + 1

2	P2(x) : 4x^3 - 2 P3(x) = P1(x) + P2(x) : 1x^7 + 14x^3 - 3x^2 - 1 P4(x) = P1(x) - P2(x) : 1x^7 + 6x^3 - 3x^2 + 3 P1(1) = 9 P2(1) = 2 P3(1) = 11 P4(1) = 7 P1(x) : 1x^7 + 10x^3 - 3x^2 + 1 P2(x) : 1x^7 + 10x^3 - 3x^2 + 1 P3(x) = P1(x) + P2(x) : 2x^7 + 20x^3 - 6x^2 + 2 P4(x) = P1(x) - P2(x) : 0 P1(2) = 197 P2(2) = 197 P3(2) = 394 P4(2) = 0

Remarks: There are three test cases in 2nd Sample Input.

Remember to appropriate free the memory space after each test case.

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