

Data Structure

Lab 5. Polynomial Long Division

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Lab 5 - Submission & Evaluation

- Submission deadline: 9 PM, May 11 (Mon)
- Online test: <http://34.64.144.206> Session ID: [3kLlAp1](#)
- Evaluation: 10 points x 1 problem (total 10 points)
 - 10 points: succeed on time (before the deadline)
 - 7 points: succeed by 9 PM, May 13 (Wed)
 - ≤ 5 points: submit a report by 9 PM, May 14 (Thur)
- Note
 - You must fill out blank parts (indicated as TODO) in the baseline code, and you must not modify the other given parts

<https://github.com/hongshin/DataStructure/blob/lab5/polydiv.c>

Polynomial Long Division (1/2)

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- Complete `polydiv.c` by adding polynomial long division operation to our linked list-based polynomial representation
 - You are asked to write the following four functions with TODO:
 - `linkedlist_clone`: receive an existing linked list and create a new linked list to have the same elements (i.e., clone)
 - `polynomial_create`: return a polynomial of the given string whose formatting is the same as `polynomial_print`
 - `polynomial_subt`: return the subtraction result of two given polynomials
 - `polynomial_div`: receive dividend and divisor polynomials and then return the quotient and the remainder polynomials
 - You must not change the other functions (except the four with TODO)
 - Note that the `main` function is given and you cannot change it

Polynomial Long Division (2/2)

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- Polynomial long division is to find the quotient Q and the remainder R of the division of a dividend A by a divisor B
 - $A = Q \times B + R$ where R has a lower degree than B
 - Example

$$\begin{array}{r} x^2 + x + 3 \leftarrow \text{quotient} \\ \text{divisor} \rightarrow x - 3 \overline{) x^3 - 2x^2 + 0x - 4} \leftarrow \text{dividend} \\ \underline{x^3 - 3x^2} \\ +x^2 + 0x \\ \underline{+x^2 - 3x} \\ +3x - 4 \\ \underline{+3x - 9} \\ +5 \leftarrow \text{remainder} \end{array}$$

- c.f., https://en.wikipedia.org/wiki/Polynomial_long_division

Input and Output (1/2)

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- Input

- Given from the standard input
- First line represents the dividend and second line represents the divisor. Each line has no more than 255 characters.
- Dividend and divisor are represented as follows:

$$(c_1) x^{d_1} + (c_2) x^{d_2} + \dots (c_n) x^{d_n}$$

where c_i is a non-zero integer and

d_i is a non-negative integer and $d_{i+1} > d_i$

- For divisor, the coefficient of the highest degree term is 1

- Output

- Print the quotient at first line and the remainder at second line
- Make sure to put newline ('\n') at the end

Examples

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- Ex. 1. $(x^2 + 3x + 2) / (x + 2)$

```
(1) _x^2+_ (3) _x^1+_ (2) _x^0↵  
(1) _x^1+_ (2) _x^0↵
```

<Input 1>

```
(1) _x^1+_ (1) _x^0↵  
↵
```

<Output 1>

- Ex. 2. $(2x^2 - 5x - 1) / (x - 3)$

```
(2) _x^2+_ (-5) _x^1+_ (-1) _x^0↵  
(1) _x^1+_ (-3) _x^0↵
```

<Input 2>

```
(2) _x^1+_ (1) _x^0↵  
(2) _x^0↵
```

<Output 2>

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