**Input**: a polynomial that will be represented as a sequence of numbers, each time an exponent followed by a coefficient as a list. The exponents will be in decreasing order. So for example,

3 5 1 10 0 5

represents the polynomial 5*x*3+10*x*+5. While the exponents are always integers, the coefficients may be rational numbers. Now, write programs to do the following:

1. Prompt the user for a polynomial input. Once that is entered, prompt the user for the input of some number *a*. Now compute the quotient and remainder obtained when the input polynomial *P*(*x*) is divided by *x*−*a*. For example, suppose the user enters the polynomial 3*x*4 + 7*x*2− *x* + 3 and enters *a* = 1, the result should be,

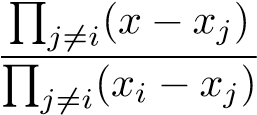
Quotient : 3*x*3 + 3*x*2 + 10*x* + 9, Remainder : 12.

Make sure this runs in *O*(*n*) time where *n* is the degree of the polynomial.

1. Write code to compute (*x* − *a*1)(*x* − *a*2)*...*(*x* − *an*) for *n* given numbers, in *O*(*n*2) time.
2. Now write code to do interpolation in *O*(*n*2) time. The problem input be a set of pairs of (*x,y*) values like

3 4 7 2 4 10

where the list is the *x* value followed by the *y* value. Here, the output will be a polynomial of degree 2. It is computed as follows. Suppose the inout is (*x*1*,a*1)*,*(*x*2*,a*2)*,...,*(*xn,an*). Then the interpolated polynomial is given by), where the polynomial *Pi*(*x*) is defined as,

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Notice that *Pi*(*xi*) = 1 and *Pi*(*xj*) = 0 for *j* 6= *i*.

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