CSE220: SYSTEMS FUNDAMENTALS I

Assignment 5
Due on 14 Nov, by 5PM

Each program should be written and tested separately (i.e., with a distinct "main"), but all should be handed-in in a single file. The results of the testing should be included in the same file, after corresponding "main"s.

1. A string may be implemented, somewhat inefficiently, as a linked list.

   (i) Write a function that reads a sequence of characters and builds such a list.
   (ii) Write a function that takes such a list and prints the character string.
   (iii) Write a function that takes two strings represented in this manner and returns the result of concatenating them.

2. A doubly-linked list is one in which each node has three components: (a) a pointer to the preceding node (except for the first node), (b) some data, and (c) a pointer to the next node (except for the last node). The complete list itself has a single pointer pointing to first item.

   Write a program that
   (i) reads an integer N,
   (ii) reads N integers and enters them into a doubly-linked list, ensuring that the contents of the list are always in ascending order,
   (iii) and print the final list.

   In (ii) make use of a function whose arguments are the list and the integer to be inserted. In (iii).

3. A polynomial may be implemented as a linked list in which each node represents a term. That is, each node consists of (a) a data item that is the coefficient of the term, (b) a data item that is the exponent, and (c) a pointer to the next term.

   (i) Write a function that as arguments takes a polynomial list and a term (i.e., coefficient value and exponent value) and makes adds the term to the polynomial.

   If a term with the same exponent is already in the list, then it should be combined with the new one. For example, if the list already has the representation of $3x^2$, and the new term is $4x^2$, then there should be a single entry, for $7x^2$.

   (ii) Write a function that builds a polynomial by repeatedly calling the function in (i). The arguments of the function should include the number of terms to be read.

   (iii) Write a function that that takes a polynomial and a value for x and returns the result of evaluation the polynomial