

Homework #2

In this assignment you will be using linked lists to represent, display, and evaluate polynomials.

The following article provides a good overview of polynomials:

<http://en.wikipedia.org/wiki/Polynomial>.

The following rules should be observed throughout the assignment:

- Each polynomial should be represented as a singly-linked list (see files “list.h” and “list.c” from the book).
- Each element in the linked list should represent one of the terms in the polynomial.
- The data held by each element should be type `double` representing the constant for that term.
- For example, the polynomial $6.0x^3 - 5.3x + 3.1$ would be represented by the linked list $6.0 \rightarrow 0.0 \rightarrow -5.3 \rightarrow 3.1$.

a) **(1 point)** Implement a function called `appendTerm`:

```
void appendTerm(List *pPolynomial, double constant);
```

This function should append (insert at the end) the value `constant` to `pPolynomial`. For example, appending `3.1` to `pPolynomial` already containing $6.0 \rightarrow 0.0 \rightarrow -5.3$ should result in the value `3.1` being added at the end: $6.0 \rightarrow 0.0 \rightarrow -5.3 \rightarrow 3.1$. If the append fails the program should exit.

b) **(2 points)** Implement a function called `display`:

```
void display(List *pPolynomial);
```

This function should output the polynomial to `stdout` in proper polynomial format. For example, displaying polynomial $6.0 \rightarrow 0.0 \rightarrow -5.3 \rightarrow 3.1$ should result in $6.0x^3 - 5.3x + 3.1$ being output.

c) **(2 points)** Implement a function called `evaluate`:

```
double evaluate(List *pPolynomial, double x);
```

This function should evaluate the polynomial for the given value of `x` and return the result. For example, given polynomial $6.0 \rightarrow 0.0 \rightarrow -5.3 \rightarrow 3.1$ and `x` having value `7.0` the function should return `2024.0` (the result of evaluating $6.0 \cdot 7.0^3 - 5.3 \cdot 7.0 + 3.1$).

d) **(4 points)** Write a program to test the functions from parts a – c. Your test program should demonstrate creating, displaying, and evaluating the following polynomials with the given values for `x`:

- | | |
|---------------|----------------------------|
| • $x + 1.0$ | with <code>x</code> = 1.0 |
| • $x^2 - 1.0$ | with <code>x</code> = 2.03 |

- $-3.0x^3 + 0.5x^2 - 2.0x$ with $x = 05.0$
- $-0.3125x^4 - 9.915x^2 - 7.75x - 40.0$ with $x = 123.45$

e) **(1 point)** Make sure your source code is well-commented, consistently formatted, uses no magic numbers/values, follows programming best-practices, and is ANSI-compliant.

Turn in all source code, program output, diagrams, and answers to questions in a single Word or PDF document.