Polynomial Extra Credit Assignment

1. You are in charge of creating a program that adds two polynomial expressions together, prints the results and then evaluates it given an X value. A breakdown of an example is shown below.

   Example

```
1  2x^2 + 3x + 5
2  5x^3 − 4x
3  = 5x^3 + 2x^2 − 1x + 5
4  = 5(1)^3 + 2(1)^2 + 1(1) + 5
5  = 13
```

   Resource Provided

   - Polynomial Extra Credit ZyLab - Lab, located in Section 7 on the book, containing program file which you must modify with your changes.

   Important Structure Definition

```
1  struct PolyTerm
2  {
3      int iCoeff = 0;      // Coefficient of polynomial term
4      int iExp = 0;        // Exponent of polynomial term
5  }
```

   Functions to Populate
   printPolynomial: Function to print the polynomial in a math format. Below is the prototype.
   printPolynomial(PolyTerm polynomialArr[], int iArraySize)

   addPolynomials: Function to add two polynomial expressions together. Below is the prototype.
   printPolynomial(PolyTerm polynomialAArr[], int iArrayASize, PolyTerm polynomialBArr[], int iArrayBSize, PolyTerm polynomialCArr[])

   solvePolynomial: Function to solve a polynomial expression given a X value. Below is the prototype.
   double solvePolynomial(PolyTerm polynomialArr[], int iArraySize, double dX);

   Program Specifications and Assumptions

   1. Your program should work for **ANY** polynomial terms. Below are some important notes regarding the polynomials

      - The program will provide you with two random polynomials sorted by their exponent term determined by a random seed.
      - Each polynomial expression can contain a different amount of terms.
      - Polynomials with negative coefficents should be printed with a subtraction sign instead of a plus sign.
      - Each provided polynomial expression will **NOT** contain negative exponent or duplicate terms. ie: $(3x^{-2}, 5x^5 + 5x^5)$ are invalid PolyTerms and thus will not be provided.

   2. The print function should not print out polynomial terms containing only zero for the coefficient and term.

   3. When solving for polynomial, X should be a double which can be negative or positive.

   Deliverables

   - Zybooks Polynomials Extra Credit Lab 7.8

Rubric

- 5 points - printPolynomial function is correct.
- 5 points - addPolynomials function is correct.
- 5 points - solvePolynomial function is correct.
- $100/n$ points - **Completely correct** solution with **proper** documentation.
  Note: n is the number of students who submitted **completely** correct solutions for a single section.

Sample Program Outputs

```
1  Start Polynomial Calculator
2  Enter integer random seed: 1
3
4  Polynomial A : 7x^6 − 7x^5 − 3x^2 + 1x^1
5  Polynomial B : 8x^7 − 9x^3 + 4
6  Polynomial A+B : 8x^7 + 7x^6 − 7x^5 − 9x^3 − 3x^2 + 1x^1 + 4
7
8  Enter a X value: 1
9  Solution for X = 1: 1
10 Do you want to enter another X (Y/N)? Y
11
12 Enter a X value: 0
13 Solution for X = 0: 4
14 Do you want to enter another X (Y/N)? Y
15
16 Enter a X value: 0.5
17 Solution for X = 0.5: 2.57812
18 Do you want to enter another X (Y/N)? N
19
20 End Polynomial Calculator
```

```
1  Start Polynomial Calculator
2  Enter integer random seed: 55
3
4  Polynomial A : 8x^5 − 3x^4 − 1x^2 − 4
5  Polynomial B : 9x^8 + 6x^7 − 4x^4
6  Polynomial A+B : 9x^8 + 6x^7 − 8x^5 − 7x^4 − 1x^2 − 4
7
8  Enter a X value: 0
9  Solution for X = 0: −4
10 Do you want to enter another X (Y/N)? Y
11
12 Enter a X value: 1
13 Solution for X = 1: −23
14 Do you want to enter another X (Y/N)? y
15
16 Enter a X value: −2
17 Solution for X = −2: −2936
18 Do you want to enter another X (Y/N)? n
19
20 End Polynomial Calculator
```