1. main.c

```
#include <stdio.h>
#include "polynomial.h"
#include <stdlib.h>
#include <string.h>

int main(){
   poly p1, p2, p3;
   int n1, n2;
   printf("Enter maximum no of terms in polynomial 1: ");
   scanf("%d", &n1);
   printf("Enter maximum no of terms in polynomial 2: ");
   scanf("%d", &n2);
   init_poly(&p1, n1);
   init_poly(&p2, n2);
   init_poly(&p3, n1 + n2);

   for(int i = 0; i < n1; i++){
      int c, e;
      printf("Enter coefficient and power of term %d of polynomial 1\n", i + 1);
      scanf("%d%d", &c, &e);
      append(&p1, c, e);
   }
   for(int i = 0; i < n2; i++){
      int c, e;
      printf("Enter coefficient and power of term %d of polynomial 2\n", i + 1);
      scanf("%d%d", &c, &e);
      append(&p2, c, e);
   }

   printf("Polynomial 1: ");
```

```
    display(p1);

    printf("Polynomial 2: ");
    display(p2);

    addition_polynomial(&p1, &p2, &p3);
    printf("Sum of Polynomials: ");
    display(p3);

    subtraction_polynomial(&p1, &p2, &p3);
    printf("Difference of Polynomials: ");
    display(p3);

    return 0;
}
```

2. polynomial.h

```
typedef struct term {
   int coef;
   int exp;
} term;

typedef struct poly {
   int n;
   term *t;
} poly;

void init_poly(poly *p, int max_terms);
void append(poly *p, int coef, int exp);
void display(poly p);
void addition_polynomial(poly *p1, poly *p2, poly *p3);
void subtraction_polynomial(poly *p1, poly *p2, poly *p3);
```

3. polynomial.c

```
#include <stdio.h>
#include "polynomial.h"
#include <stdlib.h>
#include <string.h>

void init_poly(poly *p, int max_terms){
   p -> n = 0;
   p -> t = (term *)malloc(max_terms * sizeof(term));
}

void append(poly *p, int coef, int exp){
   p -> t[p -> n].coef = coef;
   p -> t[p -> n].exp = exp;
   p -> n++;
}

void display(poly p){
   for(int i = 0; i < p.n; i++){
      if(p.t[i].coef < 0){
         printf(" - %dx^%d", - (p.t[i].coef), p.t[i].exp);
      }else{
         if(i > 0){
            printf(" + ");
         }
         printf("%dx^%d", p.t[i].coef, p.t[i].exp);
      }
   }
   printf("\n");
}
```

```
void addition_polynomial(poly *p1, poly *p2, poly *p3){
   int i = 0, j = 0;
   p3 -> n = 0;
   while(i < p1 -> n && j < p2 -> n){
      if(p1 -> t[i].exp > p2 -> t[j].exp){
         append(p3, p1 -> t[i].coef, p1 -> t[i].exp);
         i++;
      }
      else if(p1 -> t[i].exp < p2 -> t[j].exp){
         append(p3, p2 -> t[j].coef, p2 -> t[j].exp);
         j++;
      }
      else{
         int sum = p1 -> t[i].coef + p2 -> t[j].coef;
         if(sum != 0){
            append(p3, sum, p1 -> t[i].exp);
         }
         i++;
         j++;
      }
   }
   while(i < p1 -> n){
      append(p3, p1->t[i].coef, p1->t[i].exp);
      i++;
   }
   while(j < p2 -> n){
      append(p3, p2->t[j].coef, p2->t[j].exp);
      j++;
   }
}
```

```
void subtraction_polynomial(poly *p1, poly *p2, poly *p3){
   int i = 0, j = 0;
   p3 -> n = 0;
   while(i < p1 -> n && j < p2 -> n){
      if(p1 -> t[i].exp > p2 -> t[j].exp){
         append(p3, p1 -> t[i].coef, p1 -> t[i].exp);
         i++;
      }
      else if(p1 -> t[i].exp < p2 -> t[j].exp){
         append(p3, -p2 -> t[j].coef, p2 -> t[j].exp);
         j++;
      }
      else{
         int diff = p1 -> t[i].coef - p2 -> t[j].coef;
         if(diff != 0){
            append(p3, diff, p1 -> t[i].exp);
         }
         i++;
         j++;
      }
   }
   while(i < p1->n){
      append(p3, p1->t[i].coef, p1->t[i].exp);
      i++;
   }

   while(j < p2->n){
      append(p3, -p2->t[j].coef, p2->t[j].exp);
      j++;
   }
}
```

Output of Polynomial Assignment:

```
E:\COEP\DSA\Assignments\LabAssignment1-PolynomialADT>gcc -Wall main.c polynomial.c -o a

E:\COEP\DSA\Assignments\LabAssignment1-PolynomialADT>a
Enter maximum no of terms in polynomial 1: 4
Enter maximum no of terms in polynomial 2: 3
Enter coefficient and power of term 1 of polynomial 1
5 4
Enter coefficient and power of term 2 of polynomial 1
8 3
Enter coefficient and power of term 3 of polynomial 1
4 2
Enter coefficient and power of term 4 of polynomial 1
7 1
Enter coefficient and power of term 1 of polynomial 2
6 3
Enter coefficient and power of term 2 of polynomial 2
5 2
Enter coefficient and power of term 3 of polynomial 2
9 1
Polynomial 1: 5x^4 + 8x^3 + 4x^2 + 7x^1
Polynomial 2: 6x^3 + 5x^2 + 9x^1
Sum of Polynomials: 5x^4 + 14x^3 + 9x^2 + 16x^1
Difference of Polynomials: 5x^4 + 2x^3 - 1x^2 - 2x^1

E:\COEP\DSA\Assignments\LabAssignment1-PolynomialADT>
```