CS19003 Programming and Data Structures Lab

Assignment Set 7 **May 16, 2023**

INSTRUCTIONS

1. There are two assignments in this Lab. You need to submit each of the three assignments separately. It is advisable to submit each assignment as you complete it, rather than wait for the end to submit everything.

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1. **[Filename: set7asg1.c]**

   Identity. You are given an array `a[]` of N distinct integers (positive or negative) in ascending order. Write a C function, `identity()`, with suitable arguments that returns an index `i` such that `a[i] = i` if such an index exists, and `-1` otherwise. **You must use binary search for this purpose.**

   In the `main()`, read N, then read the N integers into a dynamically allocated array `a[]`, then sort and print them in ascending order using any algorithm, and then call the function, `identity()`, and print its return value.

2. **[Filename: set7asg2.c]**

   Root of a polynomial. Let `f` be a polynomial with `f(a) < 0` and `f(b) > 0` for given a and b. This means that there is a root of the polynomial between a and b. Use the principle of binary search to find c between a and b by repeatedly halving the interval of search, until `f(c) < 0.0001`. Therefore:

   (a) Write a function, `float evalpoly(int poly[], int k, int x)`, that returns the value of a `k`-degree polynomial `poly[]` at a point `x`. For example, for evaluating $9x^3 + 3x + 5$ at `x = 2.0`, we have the coefficients `poly[] = {5, 3, 0, 9}`, the degree `k = 3`, and the value returned for `x=2.0` is `72.0 + 6.0 + 5 = 83.0`

   (b) Write a function, `float myroot(int poly[], int k, float a, float b)`, that returns the root of the k-degree polynomial between a and b (namely the value of c for which `f(c) < 0.0001`). If `f(a)` and `f(b)` have the same sign, the function should return some error value that enables the calling program to understand that the function returns failure.

   Write a `main()` that reads the values of `k, a, b`, and the coefficients `poly[]`, then calls `myroot()` to find and print the root of the polynomial between a and b. If `f(a)` and `f(b)` have the same sign then `main()` should print an error statement.