

Assignment 1

Design and Analysis of Algorithms

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Submission Deadline: 06/03/2022

1. Write a C program to implement selection sort. Prove the correctness of your algorithm. What is the time complexity (best case, average case, worst case) of your algorithm?
2. Write a iterative C program to print the n^{th} fibonacci number. Find the time required to execute your program when $n = 10, 20, 30, 40$. Now write a recursive program for the same. Justify the differences in execution time for the two versions.
3. A polynomial is an ADT of the form

$$p(x) = a_1x^{e_1} + \dots + a_nx^{e_n}.$$

Design an array-based data structure to represent polynomials. Write a C program to implement polynomial addition and polynomial multiplication. Perform the same operations for a linked-list based representation of polynomials.

4. Build an arithmetic calculator that takes an infix expression as input, converts it to prefix expression, and then finally evaluate it and outputs the answer. Your calculator should support exponentiation, multiplicative (multiplication, division, modulus), and additive (addition, subtraction) operations.