1 Practice Problems (Not to be handed in)

1. Problems (Chapter 0) 0.1, 0.2, 0.3

2 Homework Problems (To be handed in)

1. Programming Contest Problems

Barry’s Game You can find the problem statement from www.cs.sfu.ca/~binay/2019/cmpt307/BarrysGame.pdf. Let (red#, green#, black#) represent the input to the problem. In the class we have shown that Barry always wins when the input is of the type (n,n,∗), (n,∗,n) or (∗,n,n) where * indicates any number. This is not sufficient (thanks to a student in the class). Note that Barry will win for inputs (1,4,∗), (7,40,∗), or (123,12,∗). Determine the general input type where Barry always wins.

Star Crossed You can find the problem statement from www.cs.sfu.ca/~binay/2019/cmpt307/StarCrossed.pdf. Write an algorithm to solve the Star-Crossed problem. You must analyze the worst case step count of the most dominant steps of the algorithm. What is the space complexity?

2. An n-degree polynomial \( p(x) \) is an equation of the form

\[
p(x) = \sum_{i=0}^{n} a_i x^i,
\]

where \( x \) is a real number and each \( a_i \) is a constant.

(a) Describe a simple \( O(n^2) \) time method to compute \( p(x) \) for a given \( x \).

(b) \( p(x) \) can be rewritten as (Horner’s method)

\[
p(x) = a_0 + x(a_1 + x(a_2 + x(a_3 + \ldots + x(a_{n-1} + x(a_n))\ldots))).
\]

For a given \( x \), now what is the cost of evaluating \( p(x) \)? How many multiplications and additions are needed?

3. Problem 0.4 of the text.