CMPT 307 Homework 1
September 10, 2019
Date due: September 23, 2019 (**in the class**).

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`.
   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.