CSI-2101 Discrete Structures (Summer 2020)
~~Mini-Test~~ Assignment #4

- DEADLINE: Thursday, July 16, 2020 at noon
- **The deadline is strict. There are only two questions. No late assignment will be tolerated.**
- TO BE SUBMITTED ON BRIGHTSPACE. You must submit one single pdf file to BrightSpace.

1. (10 marks) For this question, you will need your student number.

   (a) (0 mark) What is your student number?

   Let t be the last digit of your student number. Consider the following non-homogeneous linear recurrence (where you have to replace t by the last digit of your student number):

   $$a_n = -a_{n-1} + 6a_{n-2} + 125(t+1)\cdot(n+1)\cdot 2^n$$
   $$a_0 = 0$$
   $$a_1 = 0$$

   (b) (2 marks) Find the solution $a_n^{(h)}$ to the associated homogeneous linear recurrence.

   (c) (6 marks) Find a particular solution $a_n^{(p)}$ to the non-homogeneous linear recurrence. I strongly suggest that you use the theorem from Course 19.

   (d) (2 marks) Find the general solution to the non-homogeneous linear recurrence.

   Note: You must provide all calculations and justifications for parts (b), (c) and (d).

2. (10 marks) Use the Master Theorem to solve the following recurrence.

   $$f(n) = 8\cdot f(n/2) + 2020\cdot n^3 \qquad (n > 1)$$
   $$f(1) = 1$$

   Note: You must provide all justifications.