

# Discrete Structures. CSCI-150. Fall 2014.

## Homework 4.

Due Wed. Oct 1, 2014.

### Problem 1 (Graded)

Given the recurrence

$$\begin{aligned}T(1) &= 1, \\T(n) &= 3T(n-1) + 1 \quad (\text{for } n > 1),\end{aligned}$$

first, find the closed form expression for  $T(n)$ . You may apply the method we used in class, where we repeatedly substitute  $T(n)$  in terms of  $T(n-1)$ , then  $T(n-1)$  in terms of  $T(n-2)$ , and so on, eventually identifying the pattern. This method is also described in Lehman and Leighton's book (p.147), where it is called "Plug-and-Chug" method.

After that, prove by induction that the closed form expression you've found is correct.

### Problem 2

Repeat the task from Problem 1 for the recurrence  $M(n) = M(n-1) + 2$ , with the base case of  $M(1) = 1$ .

### Problem 3 (Graded)

Solve linear recurrence

$$\begin{aligned}f(0) &= 1, \quad f(1) = -1, \\f(n) &= f(n-2).\end{aligned}$$