**University of Nevada, Las Vegas Las Vegas Computer Science 477/677 Fall 2019**

**Assignment 3: Due Wednesday September 11, 2019**

**Name:**____________________________________________________________

You are permitted to work in groups, get help from others, read books, and use the internet. But the handwriting on this document must be your own. Print out the document, staple, and fill in the answers. You may attach extra sheets, but only by stapling. Turn in the pages to the graduate assistant at the beginning of class, September 11.

1. Work Problem 2.4 on page 71 of your textbook.

2. The following problem is similar to problem 3.5 on page 71 of in your textbook. Solve the followring recurrences. Give a $\Theta$ bound if possible; otherwise if an $\Omega$ or an $O$ bound.

   (a) $T(n) \leq 5T(n/5) + 1$

   (b) $T(n) = 5T(n/5) + n$

   (c) $T(n) \geq 5T(n/5) + n^2$

(d) $T(n) = 25T(n/5) + n^2$

(e) $T(n) \leq T(n-1) + n^4$

(f) $T(n) = 3T(n-1) + 1$

(g) $T(n) \geq T(\sqrt{n}) + 1$

3. Work problem 2.13(a,b) in your textbook.

4. Work problem 2.16 in you textbook.

5. Work problem 2.22 in you textbook.

6. If $f(n)$ is an increasing function, We say that $f$ is *polylogarithmic* if $\log(f(n)) = \Theta(\log\log n)$. We say that $f$ is *polynomial* if $\log(f(n)) = \Theta(\log n)$. We say that $f$ is *exponential* if $\log(f(n)) = \Theta(n)$.

   It turns out that not every increasing function falls into one of those classes. Suppose $F$ satisfies the recurrence:

$$F(n) = F(n/2) + F(n-1) + 1$$

   It is obvious that $n < F(n) < 2^n$, so $R$ grows at least as fast as polynomial but no faster than exponential.

   (a) Is $F$ polylogarithmic? (Hint: No.)

   (b) Is $F$ polynomial?

   (c) Is $F$ exponential?