Test 1: CS 5381 Analysis of Algorithms

1:00 - 1:50 PM on 09/28/2022
Max. 100 points

Name: **R#:** **Signature:**

You may extend your solutions to the other side of this paper.

1. The asymptotic notations can be extended to the case of two parameters n and m that can go to infinity independently at different rates. For a given function $g(n,m)$, we denote by $O(g(n,m))$ the set of functions

$$\begin{aligned} O(g(n,m)) \;=\; \{f(n,m) :\; & \text{there exist positive constants } c, n_0, \text{and } m_0 \\ & \text{such that } 0 \le f(n,m) \le cg(n,m) \text{ for all } n \ge n_0 \text{ or } m \ge m_0\} \end{aligned}$$

(a) (25 points) Provide the corresponding definition for $\Omega(g(n,m))$.
(b) (25 points) Provide the corresponding definition for $\Theta(g(n,m))$.

2. (50 points) Use the master theorem to find the running time of the recurrence

$$T(n) = 3T(n/2) + n\lg n.$$