

GIT Department of Computer Engineering
CSE 222/505
Spring 2013

Homework 02
Due date: March 25th 2013 23:59

1- For each $f(n)$ and $g(n)$ below, it is either $f(n)$ is in $O(g(n))$ or $g(n)$ is in $O(f(n))$. Using only the definition of O notation and the proof methods you learned in discrete math class, prove which one is correct.

- $f(n) = (n^2 - n)/2$, $g(n) = 4n$
- $f(n) = n + \log n$, $g(n) = n * \text{SquareRoot}(n)$
- $f(n) = 2(\log n)^2$, $g(n) = \log n + 1$

2- Prove using only the definitions of asymptotic notations

- n is in $O(2^n)$
- 2^n is in $O(n!)$
- $n! = \Omega(2^n)$.
- if $f(n) = O(g(n))$, then $f(n)^k = O(g(n)^k)$

3- Find two functions $f(n)$ and $g(n)$ that satisfy the following relationships. If no such f and g exist, write "None."

$$f(n) = o(g(n)) \text{ and } f(n) \neq \Theta(g(n)).$$

$$f(n) = \Theta(g(n)) \text{ and } f(n) = o(g(n)).$$

$$f(n) = \Theta(g(n)) \text{ and } f(n) \neq O(g(n)).$$