

King Fahd University of Petroleum and Minerals

College of Computer Science and Engineering
Information and Computer Science Department

ICS 353-04: Design and Analysis of Algorithms

Spring 2006-2007

Quiz#1, Monday February 26, 2007.

Name:

ID#:

1. (8 points) What is the definition of a function $f(n)$ being in $o(g(n))$? Give an example of two functions $f(n)$ and $g(n)$ such that $f(n) = o(g(n))$.

$$f(n) = o(g(n)) \text{ if } \forall c > 0 \exists n_0 \in \mathbb{N} \text{ s.t.} \\ f(n) < c \cdot g(n) \quad \forall n > n_0. \quad +5$$

$$f(n) = 1, \quad g(n) = n \quad +3$$

2. (12 points) Using the definition, prove that $n^2 + 10n \log n$ is in $O(n^2)$.

$$\text{To find } n_0 \text{ \& } c > 0 \text{ s.t.} \\ n^2 + 10n \log n \leq c \cdot n^2 \quad \forall n > n_0 \quad +3$$

Let $c = 11$, then

$$n^2 + 10n \log n \leq n^2 + 10n^2 \text{ iff}$$

$$10n \log n \leq 10n^2 \Leftrightarrow \log n \leq n \text{ which is true for all } n \in \mathbb{N}$$

+9

∴ Given $c = 11$

$$n^2 + 10n \log n \leq 11n^2 \quad \forall n \geq 1.$$