Computer Science 477/677 Fall 1998 Short Quiz, September 22, 1998

Name:_____

No books, notes, or scratch paper. Use pen or pencil, any color. Use the rest of this page and the backs of the pages for scratch paper. If you need more scratch paper, it will be provided.

The entire test is 80 points.

1. True or False. [5 points each]

    (a) Quicksort on an array of n items takes $O(n \log n)$ time. _____

    (b) Computers are so fast nowadays that it doesn't matter whether programs are efficient. _____

    (c) $\log n = O(\sqrt{n})$ _____

    (d) If $f(n) = O(g(n))$, then $\log(f(n)) = O(\log(g(n)))$. _____

    (e) $\lg^*$ grows so slowly that $\lg^*(n)$ never exceeds 100. _____

    (f) If $\log(f(n)) = O(\log(g(n)))$. then $f(n) = O(g(n))$. _____

2. Give a mathematically correct definition of the statement, "$f(n) = O(n^2)$" [10 points]

3. Give a mathematically correct definition of the statement, "$g(n) = \Theta(n^3)$" [10 points]

4. Solve the following recurrences. [10 points each]

(a) Give $G(n)$ in Θ notation:

$$G(n) = G(n-1) + n^2$$

(b) Give $F(n)$ in O notation:

$$F(n) = O(F(\tfrac{n}{2})) + O(n^2)$$

(c) Give $H(n)$ in O notation:

$$H(n) = H(\log n) + 1$$