CS 173: Discrete Structures, Fall 2009
Review problems for second quiz

You should do these problems to help prepare for the second quiz. Solutions will be posted but you don't have to turn them in.

1. **Big-O notation**

   For each of the following pairs of functions state whether $f(n) = O(g(n))$ or $f(n) = \Omega(g(n))$ or $f(n) = \Theta(g(n))$

   (a) $f(n) = \lceil n \rceil^2$ and $g(n) = \lfloor n \rfloor^2$.

   (b) $f(n) = (log_{10}(n))^2$ and $g(n) = n$.

   (c) $f(n) = n^{2^n}$ and $g(n) = n^{n^2}$

   (d) $f(n) = n!$ and $g(n) = n^n$

   (e) $f(n) = 2^n + n$ and $g(n) = 3^n$

   Determine whether each statement below is true or false.

   (f) If $f(n) = \Theta(g(n))$ and $h(n) = \Theta(g(n))$ then $f(n)h(n) = \Theta(g(n))$.

   (g) If $f(n) = \Omega(g(n))$ and $h(n) = \Omega(g(n))$ then $f(n) + h(n) = \Omega(g(n))$.

   (h) If $f(n) = O(g(n))$ then $g(n) = \Omega(f(n))$.

   (i) If $f(n) = \Theta(g(n))$ then $g(n) = \Theta(f(n))$

   (j) If $f(n) = log_a(n)$ for $a > 2$ then $f(n) \neq \Theta(log_2(n))$.