CIS 606 Homework 2 Fall 2020

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1. $F(n) = \Omega(g(n))$ implies $g(n) = 0(f(n))$

   Answer: True

   By definition
   $f(n) = \Omega(g(n))$ which implies $O <= c.g(n) <= f(n)$
   $g(n) = 0(f(n))$ which implies $O <= g(n) <= c.f(n)$

   Let us assume that $f(n) = 100n^2$, $g(n) = n^2$

   $f(n) >= c.g(n)$
   $100.n^2 >= c.n^2$
   Consider the constant c = 50

   $100n^2 >= 50n^2$
   $2 >= 1$

   $g(n) = \mathrm{O}(f(n))$ which is equal to

   $c.f(n) >= g(n)$
   $c.100.n^2 >= n^2$
   $50.100.n^2 >= n^2$
   $5000 >= 1$

   Based on the above equations $F(n) = \Omega(g(n))$ implies $g(n) = \mathrm{O}(f(n))$ is true.

2. $T(n) = 2T(n/2) + n^4$

   Let us assume that $n = n/2$

   $T(n/2) = 2T(n/4) + (n/2)^4$
   $T(n/2) = 2T(n/4) + n^4/16$