Analysis Of Algorithms

Assignment 1
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1. 2^{2n+1}
   $2^{2^{\wedge}n}$
   (n+1)!
   n!
   e^n
   $n * 2^n$
   2^n
   $(3/2)^n$
   $n^{lg(lg(n))}$, $lg(n)^{lg(n)}$
   (lg(n))!
   n^3
   n^2, $4^{lg(n)}$
   n lg(n), lg(n!)
   n, $2^{lg(n)}$
   $(sqrt(2)^{lg(n)})$
   $2^{sqrt(2\ lg(n))}$
   $(lg(n))^2$
   ln(n)
   sqrt(lg(n))
   ln(ln(n))
   1, $n^{1/lg(n)}$

2. A^x, x^c, kthrt(x), log_b(x)
3. (a) <u>Lemma</u> $n = O(n^2)$
   Consider N ≥ 1, c = 1
   Suppose n ≥ 1
   $1 \le n \Rightarrow n \le n^2$ - By definition both sides are positive
   $|n| \le 1 * |n^2|$

   (b) <u>Lemma</u> $n^2 = O(n^2)$
   Consider N ≥ 1, c = 1
   Suppose n ≥ 1
   $1 \le n$
   $0 \le 0$
   $n^2 \le n^2$ - Multiply both sides by 0 then add n^2
   $|n^2| \le 1*|n^2|$

   (c) <u>Lemma</u> $3n^2+5n = n^2$

Consider N ≥ 1, c = 8
Suppose n ≥ 1 => 1 ≤ n
$n \leq n^2$
$5n \leq 5n^2$
$3n^2 + 5n \leq 8n^2$
$|3n^2+5n| \leq 8 * |n^2|$

4. ln(n) - ln(1) is O(ln(n)) because:
lim_n->inf (ln(n) - ln(1)) / ln(n) is 1 - 0, nonzero constant means that ln(n) - ln(1) is Θ(ln(n)) which by definition makes it big 0 of n. If H_n is less then ln(n) - ln(1) then it is also O(ln(n)

6. (a) <u>Base Case:</u>
f(2; a, b) = f(1; b, a+b)
= a + b
f(2; a, b) = f(1; a, b) + f(0; a, b)
= a + b
<u>Assume:</u>
f(k;a, b) = f(k-1; a, b) + f(k-2; a, b)
<u>Show:</u>
f(k+1; a, b) = f(k; a, b) + f(k-1; a, b)

f(k+1; a, b) = f(k; b, a+b)
= f(k-1; b, a+b) + f(k-2; b, a+b)
= f(k; a, b) + f(k-1; a, b)
f(k+1; a, b) = f(k; a, b) + f(k-1; a, b)