MAHARISHI INTERNATIONAL UNIVERSITY

Algorithm assignment 1

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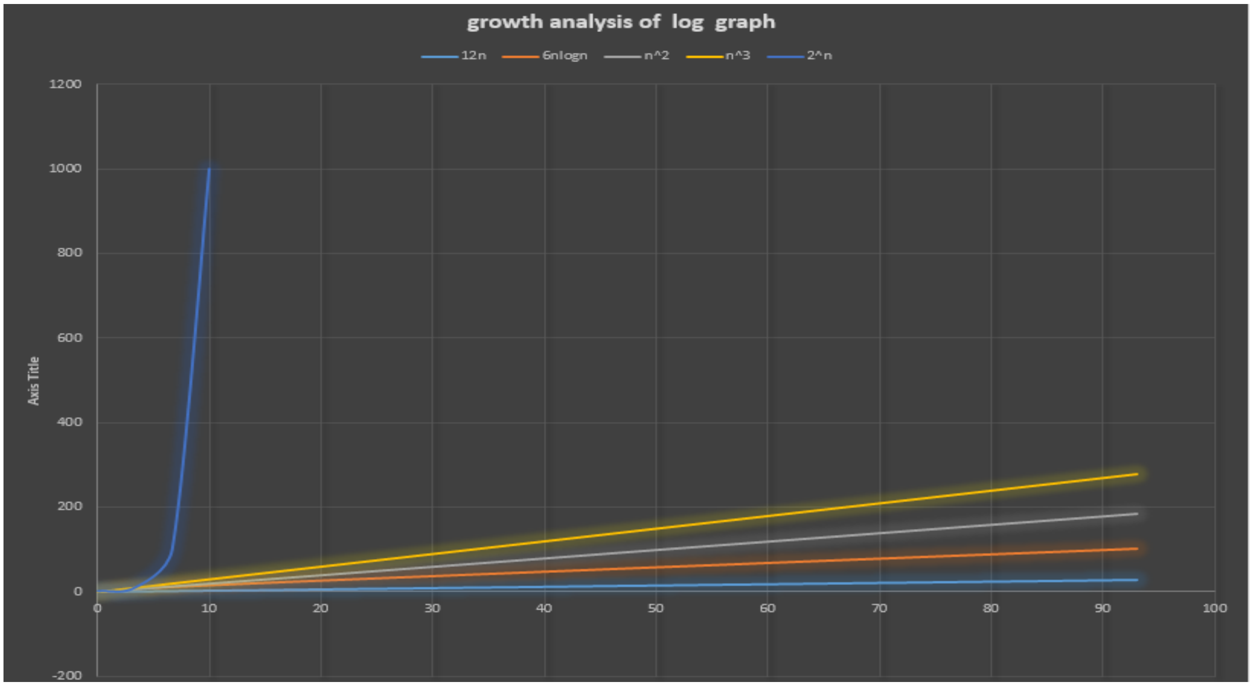
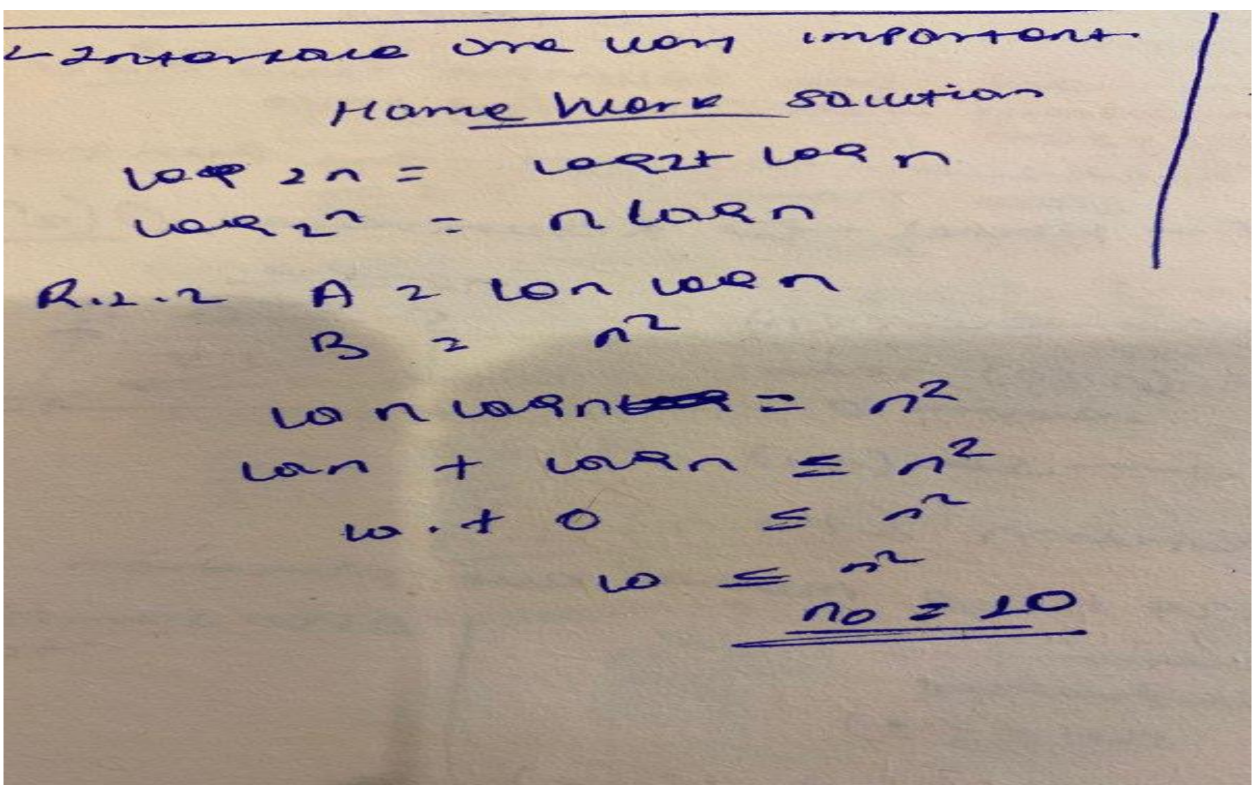
Assignment one

R-1.1 Graph the functions 12n, 6n log n, n 2 , n 3 , and 2n using logarithmic scale for the xand y-axes; that is, if the function value f(n) is y, plot this as a point with x-coordinate at log n and y-coordinate at log y.

C	D	E	F	G	H	I	J
log n	12n	6nlogn	n^2	n^3	2^n		
0	1.079181246	#NUM!	0	0	1		
3.321928095	2.079181246	7.638911441	6.64386	9.96578428	10		
6.64385619	3.079181246	11.96083954	13.2877	19.9315686	100		to the base 2
9.965784285	4.079181246	15.86773013	19.9316	29.8973529	1000		
13.28771238	5.079181246	19.60469573	26.5754	39.8631371			
16.60964047	6.079181246	23.24855192	33.2193	49.8289214			
19.93156857	7.079181246	26.83351442	39.8631	59.7947057			
23.25349666	8.079181246	30.37783493	46.507	69.76049			
26.57542476	9.079181246	33.89240811	53.1508	79.7262743			
29.89735285	10.07918125	37.3842612	59.7947	89.6920586			
33.21928095	11.07918125	40.85819239	66.4386	99.6578428			
36.54120904	12.07918125	44.31762401	73.0824	109.623627			
39.86313714	13.07918125	47.76508299	79.7263	119.589411			
43.18506523	14.07918125	51.2024883	86.3701	129.555196			
46.50699333	15.07918125	54.6313316	93.014	139.52098			



R-1.2 Algorithm A uses 10n log n operations, while algorithm B uses n 2 operations. Determine the value n0 such that A is better than B for n ≥ n0.



R-1.6 Order the following list of functions by the big-O notation. n log n log log n 1/n 4n 3/2 5n 2n log2 n 2 n 4 n n 3 n 2 log n 4 log n √n

Ascending order	equation
1	1/n
2	Log log n
3	Sqrt(n)
4	5n
5	N log n
6	2nlogn^2n
7	4n^3/2
8	4^logn
9	N^2 logn
10	N^3
11	2^n
12	4^n

$10 \cdot \log 2 \geq 10$

$10 \geq 10$ – that is true

$\underline{n_0 = 10}$

Algorithm loop

$s \leftarrow 0$	$O(1)$
for $i \leftarrow 0$ to n do	$O(n)$
$\quad s \leftarrow s + i$	$O(n)$

$T(n) = O(n)$

Algo loop(n)

s ← 0 —— $O(1)$

for i ← 1 to n^2 do —— $O(n^2)$

for j ← 1 to i do $\quad \sum_{i=1}^{n^2} i = \frac{n^2(n^2+1)}{2}$

s ← s + i $\quad = O(n^4)$

$T(n) = O(n^4)$

Prove

$\log b^{x^a} = a \log b^x$.

Proof Soun

Recall

$\boxed{\log_b x = a}$ means in other way $\boxed{b^a = x}$

If $\log b^x = y$ means $b^y = x$

or $\log b^x$ means $b^? = x$

let say $y = \log b^x$

In exponent form

if $y = \log b^x$ then $b^y = x$

$(b^y)^a = (x)^a$. $b^{(y)a} \rightarrow b^{ya}$

$b^{ya} = x^a$

in logarithmic form must be the settlement & new ①

$\log_b x^a = \log b^{ya} = \underline{ay}$

$y = \log_b x$ so $\underline{a \log_b x} = \underline{\log b^{x^a}}$