

Assignment 1

R-1.2 Algorithm A uses $10n \log n$ operations, while algorithm B uses n^2 operations. Determine the value of n_o such that A is better than B for $n \geq n_o$

Solution:

$$10n \log n \leq Cn^2$$

$$10 \log n \leq Cn$$

Let $c = 10$

$$10 \log n \leq 10n$$

This statement is true for value of $n_o = 1$

So it is true for any value of $n \geq 1$

R-1.6 Order the following list of functions by the big-O notation.

Solution:

$\log \log n$, $\frac{1}{n}$, \sqrt{n} , $4^{\log n}$, $n \log n$, $2n \log n$, $5n$,
 2^n , 4^n , $4n^{3/2}$, $n^2 \log n$, n^3 .

R-1.10 Give a big-O characterization, in terms of n , of the running time of the Loop1 method below:

Algorithm Loop1(n)	
$s \leftarrow 0$	1
<i>for</i> $i \leftarrow$ to n <i>do</i>	n
$s \leftarrow s + i$	n
$s \leftarrow 0$	1
$O(n)$	

R-1.14 Perform a similar analysis for method Loop5 below:

Algorithm Loop5(n)	
$s \leftarrow 0$	1
<i>for</i> $i \leftarrow$ to n^2 <i>do</i>	n^2
<i>for</i> $j \leftarrow$ to i <i>do</i>	n^4
$s \leftarrow s + i$	n^4
$O(n^4)$	

Prove:

$$\log_b x^a = a \log_b x$$

Suppose:

$$x = b^y \text{ then } y = \log_b x$$

Let rise both side with the same constant a

$$x^a = (b^y)^a$$

Take the logarithm both side

$$\log_b x^a = \log_b (b^y)^a$$

$$=(ya) \log_b b, \text{ but } \log_b b = 1$$

$$=ya, \text{ but we supposed } y = \log_b x$$

$$=a \log_b x$$

$$\log_b x^a = a \log_b x$$