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 from:

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

$$4^{\log n} = (2^2)^{\log n} = n^2$$

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
$for\ i \leftarrow to\ n\ \ do$	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
$for\ i \leftarrow to\ n^2\ \ do$	n^2
$for\ j \leftarrow to\ i\ \ do$	n^4
$s \leftarrow s + i$	n^4
	$O(n^4)$

Prove:

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

Suppose:

$x = b^y$ than $y = \log_b x$

Let rise both side with the same constant a

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

Take the logarithm both side

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

$=(ya)\ \log_b b$, but $\log_b b = 1$

$=ya$, but we supposed $y = \log_b x$

$= a \log_b x$

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