Assignment I

O suppose two functions f(x) and g(x) are defined on some subset of the real numbers:

if and only if there exists a positive real c and a positive integer no, such that for all n = no, f(n) = c.g(n)

Important Item:

- change of base rule:

$$\log_b(a) = \frac{\log_k(a)}{\log_k(b)}$$

broof:

$$\log_{\alpha} x = y$$

logba = logbx = divid both sides by logb

Ylogba = logbx = move the y out front

Togba Togba = divide both sides by logba

$$\gamma = \frac{\log_b x}{\log_b \alpha}$$

continued

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We say two set are equal if they have the same elements.

$$f(x) = \{ \log_2(10) \}$$
, $g(x) = \{ \log_{10}(10) \}$
 $\rightarrow f(x) = \{ 3.32 \}$, $g(x) = \{ \log_2(10) \}$

Therefore:

 $F(x)\{3.32\} = g(x)\{3.32\}$

and the two sets are equal. So, f(x) = O(g(x)) and shows that the base of the logarithm doesn't matter.

(a)
$$T(n) < \begin{cases} 1 & n=1 \\ 2T(n/3)+n & n > 2 \end{cases}$$

$$T(n) = T(n/3) + T(n/3) + n$$

$$= 2T(n/3) + h$$

$$= 2(2T(n/3) + n/3) + n$$

$$= 2^{2}T(n/3) + n + n$$

$$= 2^{2}(2T(n/3) + n/3) + 2n$$

$$= 2^{3}T(n/3) + 3n$$

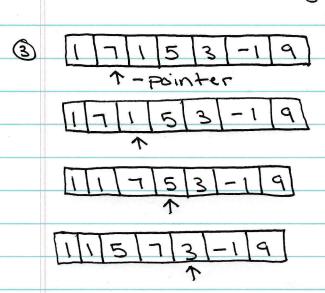
$$= 2^{3}T(n/3) + 3n$$

let:

now:

$$T(n) = \ln + n \log n$$

= $O(n \log n)$



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Assignment 1

5) The median-of-three takes the middle element of the sorted left-most, right-most and middle of the array.

Example: 1/3 2/3

We would at most pick two partitions of size 2/3. By picking the median of three elements we are reducing the probability of picking a bad pivot. By sorting the three klements we increase are chance of picking a good pivot (increases the probability).