ESTO ES TIGRES

CSCI 570

Homework #2

Graded Problems

1) Chapter 2, Exercise 3

Ascending Order of Growth Rate

Exponential: 10^n, 100^n

Polynomial: $n^{2.5}$, $\sqrt{2}\, n^{1/2}$, $n+10$, $n^2 \log n$

Answer:

$\sqrt{2n}$, $n+10$, $n^2 \log n$, $n^{2.5}$, 10^n, 100^n

2) Chapter 2, Exercise 4

Ascending Order of Growth Rate

Exponential: $2^{(\log n)^{1/2}}$, 2^n, 2^{2n}, 2^{n^2}

Polynomial: $n^{4/3}$, $n(\log n)^3$, $n^{\log n}$

Ordering of exponentials:

$2^{\sqrt{\log n}}$, 2^n, 2^{n^2}, 2^{2n}

Ordering of polynomials:

$n(\log n)^3$, $n^{\log n}$, $n^{4/3}$

∴ Answer:

$n(\log n)^3$, $n^{\log n}$, $n^{4/3}$, $2^{\sqrt{\log n}}$, 2^n, 2^{n^2}, 2^{2n}

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3) Chapter 2, Exercise 5

a) $\log_2 f(n)$ is $O(\log_2 g(n))$

If $\lim_{n\to\infty} \frac{f(n)}{g(n)} = c > 0$, then

$f(n) = O(g(n))$

$\lim_{n\to\infty} \frac{\log_2 f(n)}{\log_2 g(n)} \approx 1$ if $f(n) \approx g(n)$

$\lim_{n\to\infty} \frac{\log_2 f(n)}{\log_2 g(n)} > 1$ if $f(n) > g(n)$

$\lim_{n\to\infty} \frac{\log_2 f(n)}{\log_2 g(n)} < 1$ and it approaches to zero as $n \to \infty$ if $f(n) < g(n)$.

∴ It is false.

b) $2^{f(n)}$ is $O(2^{g(n)})$, using the same counterexample as in part a, it is false.

If $f(n) < g(n)$, $\lim_{n\to\infty} \frac{2^{f(n)}}{2^{g(n)}} < 1$

and it approaches to zero as $n \to \infty$.

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c) $f(n)^2$ is $O(g(n)^2)$, using the same counterexample as in part a, it is false.

If $f(n) < g(n)$, $\lim_{n \to \infty} \frac{f(n)^2}{g(n)^2} < 1$

and it approaches to zero as $n \to \infty$.

4)
a - false
b - true
c - true
d - false
e - true

5) Chapter 3, Exercise 2

BFS (s):
Set Discovered[s] = true and Discovered[v] = false for all other v
Initialize L[0] to consist of the single element s. Set the cycle flag to false.
Set the layer counter i = 0
Set the current BFS tree T = $\emptyset$
While L[i] is not empty and a cycle has not been found
  Initialize an empty list L[i+1]
  For each node $u \in$ L[i]
    Consider each edge (u,v) incident to u
    If Discovered[v] = false then
      Set Discovered[v] = true
      Add edge (u,v) to the tree T

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        Else Discovered[v] = true then
            Output the cycle
            Set a the cycle flag to
            true.
            Break out of the for loop
        Endif
    Endfor
    Increment the layer counter i by one
Endwhile
```

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