Stephen Woodbury 4/20/17 CMPS 102

I have read and agree to the collaboration policy. Stephen Woodbury.
Grading: Homework Heavy
Collaborators: none

Assignment 1_2 : Time Complexity
a) Ranking
Solution:
Ranking[by increasing rate of growth]: gacrepqmobhdfsjltikn

Equivalence classes arranged in increasing order of growth:
EC1:g EC2:a EC3:cr EC4:e EC5:pq EC6:mo EC7:bh
EC8:d EC9:fs EC10:j EC11:l EC 12:t EC13:ik EC14:n

b) Statement Validity
<u>Statement 1:</u> *Always True*

<u>PF:</u> Plug into the definition of big Omega:
0 <= c * [max(f(n), g(n))] <= f(n) + g(n) for n>=b.
This is true if c=1 and b = 0 (asymptotically non-negative)
Therefore the statement is always true.

<u>Statement 2:</u> Never True

<u>PF:</u> Analyze definition of little omega:
0 <= c*g(n) < f(n) for all values c > 0 and for all n>=0
Analyze definition of Big O:
0 <= f(n) <= c'*g(n) for a value c' >0 and for all n>=0
For f(n) = w(g(n)) and for f(n) = O(g(n)),
it must be that 0 <= f(n) <= c'*g(n) and 0 <= c'*g(n) < f(n)
There is no such constant c' that allows this.

<u>Statement 3:</u> Sometimes True

Example where statement is true: f(n) = x and g(n) = x^2
f(n) = O(g(n)).
Example where statement is false: f(n)=sin(n) and g(n)=cos(n).
lim as n->infinity of f(n)/g(n) = negative infinity to positive infinity. This shows that f(n) doesn't exist in O(g(n)) and in turn g(n) can't exist in big Omega f(n).
lim as n->infinity of g(n)/f(n) = negative infinity to positive infinity. This shows that g(n) doesn't exist in O(f(n)) and in turn f(n) can't exist in big Omega g(n).
Therefore statement 3 isn't true here.