Joshua Cole

Problem 1.1

b. Is $f(n) + g(n) = \theta(max(f(n), g(n)))$ sometimes, always, or never true?

I believe that it is always true.

If $f(n)$ is asymptotically larger than $g(n)$, than there is a function within $\theta(f(n))$ which contains $g(n)$. The reverse is also true: whenever $g(n)$ is asymptotically larger, $\theta(g(n))$ will have a function within it that contains $f(n)$. This leaves only the case in which they are equal. In this case adding $g(n)$ to $f(n)$ is equivalent to $2f(n)$. That constants are contained should be obvious, so the last case is true too.