Q1 (20 points; 2 per part) DPV Problem 0.1 (parts a and j): In each of the following situations, indcate whether $f = O(g)$, or $f = \omega(g)$, or both (in each case $f = \theta(g)$).

	$f(n)$	$g(n)$	answer
(a)	$n - 100$	$n - 200$	$O(g)$
(b)	$n^{\frac{1}{2}}$	$n^{\frac{2}{3}}$	answer
(c)	$100n + log\ n$	$n + (log\ n)^2$	answer
(d)	$n\ log\ n$	$10n\ log\ 10n$	answer
(e)	$log\ 2n$	$log\ 3n$	answer
(f)	$10\ log\ n$	$log(n^2)$	answer
(g)	$n^{1.01}$	$nlog^2\ n$	answer
(h)	$\frac{n^2}{log\ n}$	$n(log\ n)^2$	answer
(i)	$n^{0.1}$	$(log\ n)^{10}$	answer
(j)	$(log\ n)^{log\ n}$	$\frac{n}{log\ n}$	answer

Q2 (10 points) Consider the following pseudo-code which takes the integer $n \geq 0n \geq 0$ as input:

```
Function bar(n)
    Print '*';
    if n == 0 then
        Return;
    end
    for i = 0 to n - 1 do
        bar(i);
    end
```

Let $T(n)$ be the number of times the above function prints a star $(*)$ when called with input $n \geq 0$. What is $T(n)$ exactly, in terms of only n (and not values like $T(n-1)$ or $T(n-2)$)? Prove your statement

Q3 (30 points) Let $f(n)$ and $g(n)$ be asymptotically nonnegative functions. Using the basic definition of θ-notation, prove that $max(f(n), g(n)) = \theta(f(n) + g(n))$

Q4 (10 points; 5 per part)

(a) is $2^{2n} = O(2^n)$?

(b) why?