1.
a. f(n) = 5n^2 + 6n^(3/2)
g(n) = n^2
We need to prove
f(n) <= Cn^2 for n >= n0 , then:
5 + 6n^(-1/2) <= C
=> choose C = 11, n0 = 1
f(n) / g(n) = (5n^2 + 6n^(3/2)) / n^2 <= 11
true

b. f(n) = 2n + 1
g(n) = n
We need to prove
f(n) <= Cn for n >= Cn0, then
2 + 1/n <= C
=> Choose n0=1, C=3
f(n) / g(n) = (2n + 1) / n <= 3
true

c. f(n) = n^2 -5n
g(n) = n
There are n0 and C satisfy:
f(n) / g(n) <= C
=> n - 5 <= C
for some large n, there's no constant C satisfy.
so it's not O(n)
true

d. f(n) = (n-3)^2
g(n) = n
Assume the statement is true, then there are n0 and C satisfy:
f(n) <= Cn for n >= Cn0, then
n - 6 + 9/n <= C
for some large n, there's no constant C satisfy.
so it's not O(n)
the statment is false

2.
a. T(n) = 3T(n/3) + 1
prove that T(n) prove T(n) <= cn
Assume a bound hold for n/3
T(n) <= cn/3 <= cn for some large n
c > 1, we done

b.
T(n) = T(n-1) + 2n
Guess T(n) = n
there exists a c and n0 such that

$T(n) >= cn$ for $n > n0$ and $c > 0$
if $n=1$ then $T(1) = 1 > c1lg(1)$ or all $c>0$

$T(n) = T(n-1) + 2n >= c(n-1)$
$=> T(n) = c\Omega(n)$

3.
a.
$a=7$, $b=3$, $f(n) = n^2$
$n^{(\log3(7))} < n^2$
=> case 2
=> $T(n)$ is $\Theta(n^2)$

b. $a=3$, $b=3$, $f(n) = n^{(1/2)}$
$n^{(\log3(3))} > n^{(1/2)}$
=> case 3
$T(n)$ is $\Theta(n^{(\log3(3))}) = \Theta(n)$

5.
a.
```
cursum = array[0]
for i=0 to n-1:
        cursum = max(array[i], cursum + array[i+1])
        maxsum = max(maxsum, cursum)
print maxsum
```
time complexity: $O(n)$