1. Yes, proof:

f(n) <= cg(n) ; ∀n ≥ n0
3n + 9 <= c (n^3) ; ∀n ≥ n0

let n0 = 1, c = 12; then

3n + 9 <= 12 (n^3); ∀n ≥ 1

2. No, by definition, we have:

f(n) >= cg(n) ; ∀n ≥ n0
3n + 9 >= c (n^3) ; ∀n ≥ n0

Since (n^3) increases at a faster rate than (3n) as n goes to positive infinity, there is no positive value (c) that will make the above inequality valid.