Practice Problems - Asymptotic Analysis

1. Show that f(n) = O(g(n)) where f(n) = n^2 and g(n) = n^2 - n
2. Show that f(n) = Ω(g(n)) where f(n) = n^2 and g(n) = n^2 + n
3. Show that n is O(n log n)).
4. Can you think of positive functions f(n) and g(n) such that f(n) is neither O(g(n)) nor Ω(g(n)).
5. Prove that if f(n) = O(g(n)), then g(n) = Ω(f(n)).
6. Show that any polynomial of degree k is θ(n^k).
7. Arrange the following functions in non-decreasing order of their rate of growth:
   n, n^2, n^3, $n^{1/2}$, log(n), n log(n), n/log(n)
8. Are the following two statements equivalent? Justify.
   - The running time of algorithm A is always O(f(n)).
   - In the worst case, the running time of algorithm A is O(f(n)).
9. R 3.19 from the book
10. R 3.21 from the book
11. T(n) = 2T(n-1) if n>0, and 1 otherwise. What is T(n) in big-Oh notation?
12. T(n) = T(n/2) + n if n>1, and T(1) = c (where c is a constant). What is T(n) in big-Oh notation?
13. C 5.21 from the book