Problem 1. Consider the formula $7n^2 + 2n^3 \log n + 4n^5$.

(a) What is the high order term?
(b) What is the second order term?
(c) What is the third order term?
(d) Write the formula in $\Theta$ notation (in simplest form).

Problem 2. Here is an algorithm to merge a sorted list of size three with a sorted list of size $n$:

Binary search the middle element of the list of size three into the list of size $n$. Then binary search first element of the list of size three into the “left side” of the list of size $n$, and last element of the list of size three into the “right side” of the list of size $n$.

(a) Write the pseudo-code for this algorithm (including the binary search).

(b) We know that binary search uses exactly $\lg(m) + O(1)$ comparisons for a list of size $m$ (in the best, worst, and average cases, as should your pseudo-code). We would like to analyze the number of comparisons for the merge algorithm.

i. What is the worst case? Just get the exact high order term.
ii. What is the best case? Just get the exact high order term.
iii. What is the average case? Just write a summation. Do not simplify.