

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.