MTH 4320 Homework 1

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Contents

1 Problem 1

Solution.
We have a triple nested loop and for the outermost loop we run $n-1$ operations then we run $n-1$ operations in the inner loop for every operation in the outer loop and so on. The running time is $(n-1)(n-1)(n-1) = O(n^3)$. ■

2 Problem 2

Solution.
We have $n-2$ operations from the outer loop where n is the input number *num*. Then we call the *is_prime* function twice for every operation and the function runs at most $n-2$ operations every time. The running time is $2(n-2)(n-2) = O(n^2)$. ■

3 Problem 3

Solution.

1. Store the first element of the input list L in a variable M.
2. For every element in L:

- If it is greater than M then update M with that element.

3. We found the first largest element M in L.
4. Let $N :=$ the first element of L.
5. For every element in L:
   - If it is greater than N but less than M then update N with that element.
6. We found the second largest element N in L.
7. Let $M := N$ and $N :=$ the first element of L.
8. Repeat steps 2-6 until we found the 10th largest element M.

The running time is $10n = O(n)$. ■

4 Problem 4

Solution.

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