**Homework 4**

2) It is not possible to have a custom (overloaded) ‘=’ operator for all possible ItemTypes in a template function. In the given example, there is no way for the compiler to ‘equate’ two items of type bottle. To overcome this, we can write our own definition for equating two Bottle objects. However, this illustrates an insurmountable problem with template classes. We cannot always assure that the user will need to use the Set class for objects of classes or data types that have well defined ‘=’ operators.

3b) We won’t be able to implement the one parameter overload of the listAll function because we can’t pass the *path* string into the recursive call. Without that, the function cannot “remember” the previous directories that are there before any file.

4a) According to this algorithm, the loop runs N3 regardless of anything else. The only redundancy it eliminates is if the distance between the two cities it has to check are the same. Otherwise, it runs a loop through N items N2 => O(N3)

4b) According to this algorithm, the first loop runs N times, and the inner loop runs up till the ith iteration of the outer loop, and innermost loop runs N times again. This makes the algorithm O(N\*Log­2N).

5a)The worst case for *unite* is when Set result is not equal to set2 or set1, and set1 and set2 have no common elements. In such a case, the assignment operator needs to assign the value of set1 to result. The assignment operation is of order N. The following for-loop runs N, and in each iteration, the get() function has to run (N-*i*) times. Therefore the order of the function is N2Log2N.

5b) The time complexity of this algorithm is NLog2N. This is because the first two for loops are each of O(N). the while loop and the final for loop are also O(N) each (because the while loop traverses through N items, and the for loop adds elements N times TO THE END OF THE VECTOR). The highest order function in the algorithm is the STL sort function. It is of order NLog2N. hence, the net order of the algorithm is O(NLog2N).