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Homework 4

2) It is not legal for the compiler to try to compare two Coord objects using the != operator. The insert function calls the “find” function in the program, which requires use of the != operator. This causes the program to fail.

3a) The time complexity is O(N^3) because the algorithm consists of three nested “for loops” that each iterate up to the “Nth” term. A triple for loop indicates that the loop will iterate to this “Nth” term up to 3 times, giving it the time complexity of O(N^3).

3b) The time complexity is O(N^3) here as well. Changing the loop limit to be “j < i” does make the algorithm marginally better -- the time complexity would be n(n-1)/2. However, this would simplify to be O(N^2) since only the highest order is paid attention to. This, combined with the final for loop, would make it a total of O(N^3) once again.

4a) The time complexity is O(N^2). This function is for a doubly-linked list. Checking if the linked list is empty is O(1) and the “get” function is O(n). The for loop, however, is O(N^2). The for loop itself is O(n), and the call to “get” and “insert” within the for loop make the loop have O(2N^2) complexity. This simplifies down to O(N^2). The call to “insert” below the for loop is O(n) and the call to swap is O(1). The time complexity of the function is therefore O(N^2) because this is the highest magnitude.

4b) This implementation of the function is simpler than the one provided in 4a. In this implementation, there is only a single for loop -- this means that the time complexity of this function is O(n). This means that this function is faster than the previous implementation given in 4a.