Quiz 7

1. Consider the algorithm below with real inputs $a_1, \ldots, a_n$ and x, and output s.

Input: $a_1, \ldots, a_n, x \in \mathbb{R}$.
Procedure: Initialize $s = 0$.
Step 1: For $i = 1, \ldots, n$,
For $j = 1, \ldots, n$,
If $i \neq j$ and $a_i + a_j = x$, set s to 1.
Output: s.

(a) Find the output with input $a_i = 2^i$, $i = 1, \ldots, 5$, and $x = 12$ and describe the relationship in general between the input and the output of the algorithm. That is, what does the algorithm *do*? (5 pts.)

(b) Find an accurate bound on the total complexity of the algorithm. Is the complexity of the algorithm $O(n^2)$? Is the complexity $O(n^3)$? *Answer the three parts separately.* (7 pts.)

2. Use the definitions to prove that if $f = O(h)$ and $g = O(h)$ then $f + g = O(h)$. (8 pts.)