MATH 11: Introduction to Discrete Structures

Homework 3

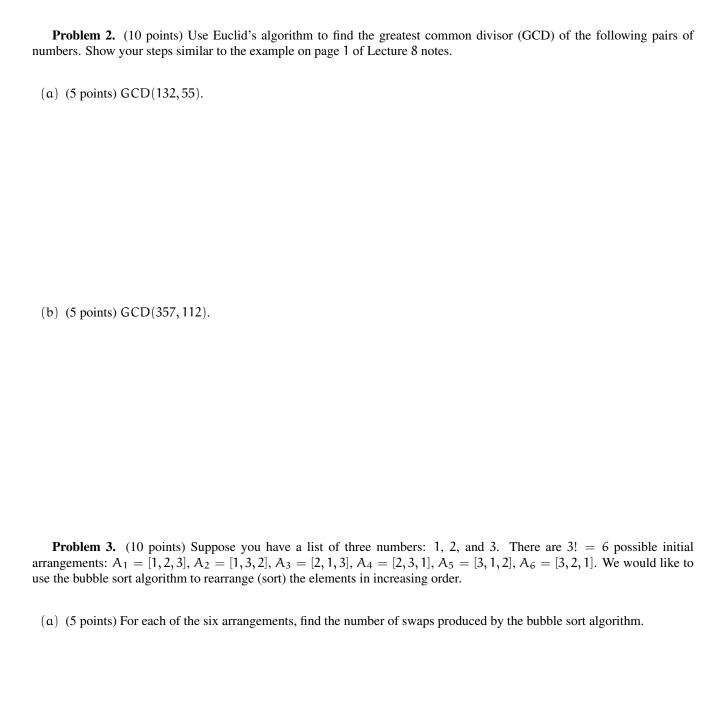
Problem 1. (10 points) Consider the Ackermann function, a two-argument function where each argument takes a nonnegative integer value. It is defined as follows:

- (I) If m = 0, then A(m, n) = n + 1.
- (II) If $m \neq 0$ but n = 0, then A(m, n) = A(m 1, 1).
- (III) If $m \neq 0$ and $n \neq 0$, then A(m, n) = A(m 1, A(m, n 1)).

Compute the values below. Show steps similar to the example on page 3 of Lecture 7 notes. You may use the value A(1,1) computed there.

(a) (5 points) A(1, 2).

(b) (5 points) A(2, 1).



(b)	(5 points) Find the average number of swaps produced by the bubble sort algorithm by computing the arithmetic mean
	of the numbers you obtained in part (a).

Problem 4. (10 points) Using the definition provided at the bottom of page 2 in Lecture 8 notes, determine whether the following statements hold.

(a) (5 points)
$$5x + ln(x) = O(x)$$
.

(b) (5 points)
$$e^{5x} + x^2 = \mathcal{O}(e^x)$$
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