MATH1058: Problem Sheet 4

Problem 1 (Sorting with mathematical programming*)**.** *Propose a mathematical programming formulation for solving the sorting problem.*

Hint: you can use a binary assignment variable x_{ij} defined for each pair of positions $i, j \in \{1, \ldots, n\}$, with $x_{ij} = 1$ if and only if item i is put in position j. You should also introduce an appropriate set of constraints to guarantee that 1) each item i ends up in exactly one position j and 2) that each item in position j is not smaller than the item in position $j - 1$.

Problem 2 (Computational complexity)**.** *Establish whether, for each of the following pairs of functions f and g, $f = O(g)$, $g = O(f)$, or both.*

$f(n)$	$g(n)$
$n - 100$	$n - 200$
$n^{1/2}$	$n^{2/3}$
$100n + \log n$	$n + (\log n)^2$
$n \log n$	$10n \log 10n$
$\log 2n$	$\log 3n$
$10 \log n$	$\log(n^2)$
$n^{1.01}$	$n \log^2 n$
$n^{0.1}$	$(\log n)^{10}$