

CS4104 Fall 2010 Homework Assignment 11  
Due at 11:00pm on Wednesday, November 10  
50 Points

**Pledge: I (we) have not received unauthorized aid on this assignment. I (we) understand the answers that I (we) have submitted. The answers submitted have not been directly copied from another source, but instead are written in my (our) own words.**

**1.** [20 points]

Consider this algorithm for finding the maximum element in an array: First sort the array and then select the last (maximum) element. What (if anything) does this reduction tell us about the upper and lower bounds to the problem of finding the maximum element in a sequence? Why can we not reduce SORTING to finding the maximum element?

**2.** [15 points]

Use a reduction to prove that multiplying two upper triangular  $n \times n$  matrices is just as expensive (asymptotically) as multiplying two arbitrary  $n \times n$  matrices.

**3.** [15 points]

Note that  $\mathcal{P}$  is the class of polynomial-time algorithms.

(a) If problem  $P$  isn't in  $\mathcal{NP}$ , is  $P$  not in  $\mathcal{P}$ ?

(b) if problem  $P$  isn't in  $\mathcal{P}$ , is  $P$  not in  $\mathcal{NP}$ ?