(1) Prove that for any $c_1, c_2 > 0$ there is an integer $n$ such that $n^{c_1} \leq c_2^n$.

(2) Prove - without the assumption that LP can be solved in polynomial time - that LP is in NP. (LP = a Linear Programming Problem). I.e. show that the optimality of a solution to an LP problem can be checked in polynomial time.

(3) Find the maximum flow in the network above. Justify your answer.

(4) List the members in your team and the title of your project. After that, give a reference to the paper(s) proving that your problem is NP complete.

(5) Three distinct integers $a, b, c$ are said to form an arithmetic progression if $a + c = 2b$. Given a set of $n$ integers, we would like to know if they contain an arithmetic progression. Describe an algorithm that answers this decision problem and give the time complexity of your algorithm. (Is it polynomial, exponential, NP?)

(6) Give a special case of your selected NP complete problem which can be solved in polynomial time.

(7) ** This problem is optional, it is for extra HW credit

Given an $n \times n$ symmetric matrix, $M$, where all entries of $M$ are integers. Decide if there is an integer $m$ such that $M^m$ contains a zero entry. What is the complexity of this problem? Is it P, NP, or something else?