These are the remaining problems for Assignment 1. The deadline is October 18, 2012, in class. No late assignments will be accepted.

Special note: Any answer that is not sufficiently clear even after a reasonably careful reading will not be considered a correct answer, and only what is written in the answer will be used to verify accuracy. No hand waiving, vague descriptions or sufficiently ambiguous statements that can be interpreted in multiple ways will be considered as a correct answer, nor will the student be allowed to add any explanations to his/her answer after it has been submitted.

Problem 3 (30 points): This question is related to two claims made by Professor *Smart*, who has also stated that he is smarter than the instructor and all the students in this class. We will examine his smartness by verifying the claims that he made.

Given an undirected, weighted graph G (with non-negative weights $w(u, v)$ for each edge $\{u, v\}$), and a constant $D > 0$, Professor *Smart* defines the graph G^{+D} as follows:

G^{+D} is identical to G except we **add** the constant D to each edge weight.

(a) [15 points] Professor *Smart* claims that:

*a minimum spanning tree (MST) of G is **always** an MST of G^{+D}.*

(b) [15 points] Professor *Smart* claims that:

*a shortest path between vertices s and t in G is **always** a shortest path between s and t in G^{+D}.*

For *each* of the above two claims, your task is the following:

- If the claim is true, then provide a proof of the claim. This will show that Professor *Smart* was *indeed smart*.

- If the claim is false, provide a counter-example and explain why the counter-example shows that the claim is false. This will show that Professor *Smart* was *not so smart* after all.

Problem 4 (10 points): What is the total space required (in Θ notation) to represent a tree of n nodes using the adjacency list representation? Justify your answer.