1. State whether each of the following is true or false. Support each answer with a short proof.

    (a) Every finite set is denumberable.

    (b) Every finite set is countable.

    (c) Every countable set that's not finite is denumerable.

    (d) If a set is not denumerable, then it's not countable.

    (e) If a set is not countable, then it's not denumerable.

    (f) Every subset of a countable set is countable.

    (g) Every infinite subset of a denumerable set is denumerable.

    (h) Every infinite subset of an uncountable set is uncountable.

    (i) Any two denumerable sets have the same size.

    (j) Any two countable sets have the same size.

    (k) Any two uncountable sets have the same size.

2. (a) Prove that the union of any two denumerable sets is denumerable.

    (b) Prove that a finite union of denumerable sets is denumerable.

3. Prove that a countable union of countable sets is countable. (Hint: See page 25, problem 10.)

4. True or False: $|[0, 1]| = |[0, 1]^2|$?

5. Prove the Compactness Theorem for propositional logic (Version II) from the Adequacy Theorem for P ("general version", page 100) and the Soundness Theorem for P ("general version").

6. Write each of the following sentences in L_{NN}.

    (a) Every natural number has a unique cube root.

    (b) Every power of 5 ends in 5.

7. Write each of the following sentences in L_{ST}

    (a) The empty set is a subset of every set.

    (b) Every set is an element of its powerset.