**373 Math Problems-Chapter 2**

**From Text book:**

2.1: 1, 4, 5, 6, 7.

2.2: 1,2 , 4, 5, 6, 7, 8, 9.

**Additional Problems:**

1. List all topologies for a set containing three distinct elements.
2. Prove that for a non empty set X, the collection is a topology on X, this topology is called co-countable topology.
3. Is there a set in which discrete and indiscrete topologies coincide on it?
4. Give an example of a nontrivial topology on an infinite set X which has only a finite number of elements.
5. If are two topologies on X, is a topology on X? Is a topology on X?
6. Prove that is the discrete topology on X iff every point in X is an open set.
7. Let . For each define .Let . Prove that is a topology on X.

**From Text book:**

2.3:1, 2, 3, 4, 5, 6, 7, 8, 9, 13.

2.4: 1, 2, 3, 4, 5, 6, 7, 10, 13, 14, 15, 16, 17,

**Additional Problems:**

1. In , do rationals form an open set? Closed set? Neither? Both? Justify your answer.
2. Consider . Find Cl(A) in .
3. Give an example of a collection of open sets whose intersection is not open.
4. Give an example of two sets A and B of In such that A and A\B are both open but B is not closed.
5. Give an example of a countable set in In that is not closed.
6. Give an example of a countable set in In that is closed.
7. Prove that
8. Prove that
9. Prove that

**From Text book:**

2.5:1,2,3,4,5,9.10.

**Additional Problems:**

1. Find a base for the open half-line topology which is different from the topology itself.
2. Let be a topological space and a base for . Prove that is dense in X iff each nonempty element of contains a point of *A*.