

**MATH 312H:**  
**FUNDAMENTAL STRUCTURES OF CONTINUOUS MATHEMATICS**

SPRING 2004

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PROBLEM LIST #1 :

Problems on this list are designed for various purposes: Those marked with \*) are homework problems; written solutions are due on the date indicated. Unmarked problems usually will be discussed in class; you should give those problems some thought beforehand. Some of those later may be designated as homework. Problems marked \*\*) are more advanced and optional; both solutions and questions in class or by email about those problems are welcome .

1\*). Write an explicit formula for a bijection between the set  $\mathbb{N}$  of natural numbers and the set  $\mathbb{Z}$  of integer numbers

2\*). Find and justify as many as you can relations involving the algebra of sets operations: the union  $\cup$ , the intersection  $\cap$ , the difference  $\setminus$ , the symmetric difference  $\Delta$  and the complement  $C$ .

3. Find a bijection between the open interval  $(0, 1)$  and the closed interval  $[0, 1]$ .

4. Find a bijection between the set  $\mathbb{R}$  of all real numbers and the closed interval  $[0, 1]$ .

5\*). Consider any configuration of disjoint open discs on the plane. Prove that the number of discs in such a configuration is finite or countable

6. Consider any configuration of disjoint figure eights on the plane. Prove that the number of elements in such a configuration is finite or countable.

7\*\*). Consider any configuration of disjoint letters "T" on the plane. Prove that the number of elements in such a configuration is finite or countable.

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\*)Due on Monday January 26.