MAT 327 Introduction to Topology
DROR BAR-NATAN

Today's reading: Munkres: All introductions, Chapter 1 Sections 1-8, Chapter 2 Section 12.

* Go over the "about" handout.

**Definition** A function $f: \mathbb{R} \to \mathbb{R}$ is *continuous* if

$$\forall x_0 \in \mathbb{R} \ \forall \epsilon > 0 \exists \delta > 0 \ \forall x \in \mathbb{R} \ |x - x_0| < \delta \implies |f(x) - f(x_0)| < \epsilon$$

**Theorem** $f: \mathbb{R} \to \mathbb{R}$ is continuous iff for every open set $U \subseteq \mathbb{R}$, $f^{-1}(U)$ is also open.

* Define open, give some examples.
* A few words on "$f^{-1}$".

* Proof. (only half was given)

Properties of open sets:
1. $\emptyset$, $\mathbb{R}$
2. $U$ finite
3. $\bigcup$ finite

**Definition** 1. A topological space
2. Continuous function $f: X \to Y$.

**Theorem** The composition of continuous functions is continuous.

**Examples** The discrete and trivial topologies:
- Continuous functions $f: X_{\text{discrete}} \to \{0\}$
- $f: \mathbb{R} \to X_{\text{discrete}}$