

24F-MATH-131B HOMEWORK 1
DUE SUNDAY, OCTOBER 13

- (1) Exercise: 1.1.13, 1.2.2, 1.2.3, 1.4.7, 1.5.2
- (2) Let (X, d) be a metric space and $E \subset X$ a subset.
 - (a) Show that if E is a finite set then E is compact.
 - (b) Suppose in addition that $d = d_{\text{disc}}$ is the discrete metric. Show that if E is compact then E is a finite set.
- (3) Give the following examples.
 - (a) Find a metric space (X, d) and an infinite collection of open subsets $\{U_n\}_{n \in \mathbb{N}}$ of X such that $\bigcap_{n \in \mathbb{N}} U_n$ is not open.
 - (b) Find a metric space (X, d) and an infinite collection of closed subsets $\{K_n\}_{n \in \mathbb{N}}$ of X such that $\bigcup_{n \in \mathbb{N}} K_n$ is not closed.