Definition 1. Accumulation Value

Let (X, d) be a metric space and (x_n) a sequence in it.

(1) A point $a \in X$ is called an accumulation value *of (x_n) if there is a subsequence $(x_{n_k})_{k \in \mathbb{N}}$ that converges to a.*

(2) The sequence is called bounded *if there is a ball $B_R(x_0)$ such that $x_n \in B_R(x_0)$ for all $n \in \mathbb{N}$.*

Exercise 2. Cauchy sequences

Let (X, d) be a metric space. Which of the following claims are correct and why?

(a) Each Cauchy sequence that has an accumulation value is a convergent sequence

(b) Each bounded sequence contains at least one accumulation value.

(c) Each bounded sequence is convergent.

(d) Each convergent sequence is a Cauchy sequence.

(e) Each convergent sequence is a bounded sequence.

(f) Each Cauchy sequence is bounded.