Info

This note, that was found here, as a part of a collection
is written (completely with human hands) by Rupadarshi Ray,
was created on July 17, 2022 4:00:41 PM,
was last modified on August 28, 2026 3:12:03 PM, and
was exported on September 7, 2026 3:25:05 PM.

adherent points

Definition. Adherent points and closure

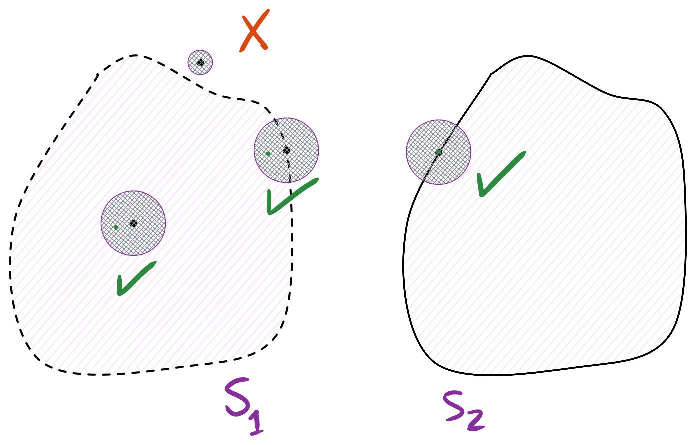
Let $S \subseteq M$ and $x \in M$. If *every* $r\text{–}B_M(x)$ contains at least one point of S

$$r\text{–}B_M(x) \cap S \neq \emptyset, \forall r > 0$$

then x **is an adherent point** or x is adherent to S.

The closure of S is

$$\text{closure}(S) := \{x \in M : x \text{ is adherent to } S\}$$

- $x \in S \implies x$ adheres to S trivially because $x \in r\text{–}B_M(a)$
  - $\implies S \subseteq \text{closure}(S)$
- 

accumulation points AKA limit points

Definition. Accumulation points AKA limit points

Let $S \subseteq M$ and $x \in M$. If *every* $r\text{–}B_M(x)$ contains at least one point of S, $a \neq x$

$$(r\text{–}B_M(x) \cap S) \setminus \{x\} \neq \emptyset, \forall r > 0$$

then x **is an accumulation point** or a limit point of S.

The derived set of S

$$\text{accu}(S) := \{x : x \text{ is an accumulation point of } S\}$$

- x is an accumulation point $\iff x$ is adherent to $S \setminus \{x\}$
- $\text{closure}(S) = \text{accu}(S) \cup S$

isolated points

Definition. Isolated point

If $a \in S$ and a is not an accumulation point of S, then a is called an **isolated point of** S**.**

- Set of all isolated points $= S \setminus \text{accu}(S)$

closed sets, closure and limit points

Definition. Closed set

A set $S \subseteq M$ is an **closed set** if $M \setminus S$ is an open set.

A subset S of a metric space M is closed iff it contains all its adherent points, i.e.

$$S \text{ is closed} \iff \text{closure}(S) \subseteq S$$

A subset S of a metric space M is closed iff it contains all its accumulation points/limit points, i.e.

$$S \text{ is closed} \iff \text{accu}(S) \subseteq S$$

Current note has 0 direct children and 0 total descendants.

- structures based on sets
  - Metric spaces
    - Metric spaces
      - adherent, accumulation points, closure of a subset in a metric space

And it has 9 siblings.

- structures based on sets
  - Metric spaces
    - Metric spaces
      - adherent, accumulation points, closure of a subset in a metric space
      - Balls in a metric space
      - Totally bounded subsets of a metric space
      - Compact subsets of a metric space

- Covering of a subset of a metric space
- Open cover of a compact metric space
- Function between metric spaces
- interior, exterior, boundary points in a metric space
- open and closed sets in a metric space