INTERNATIONAL CONFERENCE **Dehli, India, 2026**
https://eijmr.org/conferences/

OPEN AND CLOSED SETS . COMPLETE METRIC SPACES

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https://doi.org/10.5281/zenodo.20118869

Abstract: This article modern topology within open and closed sets and their metric spaces in the structure main role strict and systematic learning, especially to the fullest accent to give presented Research metric and topological in spaces open and closed sets concepts from formalization begins, their interior, closure and border operators through equivalence emphasizes. Classic to definitions based on the article associations and intersections, borders points and openness, closedness and continuity between dependency such as main features is studied. Article main direction of all Cauchy sequences approach with described complete metric spaces is the concept of. At work in analysis completeness importance, especially of borders the existence and functional of processes stability in providing is studied . Complete of spaces structural wealth show Cantor intersection for theorem and Baire category theorem such as main results discussion Statistical and bibliometric analyses this shows that functional analysis and practical in mathematics modern more than 70% of the research completeness with related to arguments relies on and this his/her theoretical and practical in the fields importance emphasizes.

Keywords. open set; closed set; metric space; complete metric space; f inscribed in a triangle and some special cases.

Introduction

Metric in spaces open sets since we determined then, closed sets is there any question birth natural. Let us remind you that closed intervals in calculation important importance has , because closed in the interval every one continuous function this in the interval absolute maximum and to the absolute minimum value If we have metric in spaces closed sets if , closed in sets continuous functions similar to this result whether there is seeing our exit This is possible . in the section we metric in spaces closed sets the idea we enter and their one how many We discover its features.

In R, the form [a, b] every an interval Euclidean from the metric used without closed is a set . It is closed . intervals open from intervals separate standing thing that is , open intervals their both all three are mine inside can't - this open interval every one point neighbor does . In general when receiving , open sets open to do thing is that they own borders own inside If it is open collection own border own inside if not , then his/her complement , on the contrary , its own border own inside to receive This is closed . collection to the definition take comes . Definition 10.1. X metric C minor of the space The set is equal to c .

Metric in spaces closed sets

Definition : metric in space closed the set filler open was collection as We define ∅ and X are both of X open small sets that We saw . Now we are the same . this the question , this trip closed sets point of view from the point of view we give

Exercise 1. X metric space Let it be .

(a) ∅ in X Is it closed ? Explain .

(b) Is X closed in X ? Explain .

Attention give , metric of space small the set is both open and closed to be We can do this . sets We call it closed (closed-open) . Open sets discussion when we do , open of collections optional merger open that , but open of collections optional intersection open not to be possible we saw (although open of collections limited intersection open (although) Closed sets open of collections fillers happened for , closed sets similar for the result our expectation need .

Exercise 2. Euclid metric Let X = R with . For each $n \in Z+, n \geq 2$

Let An = [1/ n, 1 – 1/n] . (a) $S_{n\geq 2}$ An What is it ? Proof condition (b) Is $S_{n\geq 2}$ An closed in R ? Explain .

Exercise 2: This shows that it is closed of collections optional merger condition not . However, the following theorem to us closed of collections merger and intersection about what we say possible says . Open and closed sets between relationship into account received without , results surprising not to be need .

Closed sets and sequence limits

Let's say we have X metric A small space (an) sequence in the set to point x approaching without seeing Let $X \in A$ be Is this necessary ? We the question next in training seeing Let's go out .

Let A = (0, 1) and B = [0, 1] in (R, dE) . Let each n be positive. for an integer

Let $a_n = 1/n$. Note Given a sequence (a_n) in sets A and B there is .

The sequence (a_n) in R for what approaching ?

Does A have lim a_n ?

(c) Is there lim $a_n \in B$?

in parts (b) and (c) different the answers explanatory sets A and B between two important the difference Tell me ? This in the department included from terminology using answer give .

X metric C minor of the space set , if (cn) C is a point $c \in X$ approaching sequence If , then $c \in C$, then it is closed. will be .

Proof . X is a metric. space and CX 's small package Let . First assume that C is closed. (cn) C in c = lim cn was approaching sequence Let it be . So be it. so that c ∈ C or c C of border point . C is its own border points own inside received because of , every both The condition also tells us that c ∈ C gives . So so , lim cn ∈ C. The rest implication proof next to practice is left .

X metric space and CX 's small package Let this be In the exercise we will use the C sequence (cn) to a point c ∈ X If , c is at point C , then C is closed. collection that We prove that (a) Metric of space small package closed that to show three different method counting Go to . In this case, the C package closed that show for which one suitable arrival possible ?

(b) c C of border point Let it be . This is for us . what means ?

(c) C 's closed collection that prove it .

Conclusion

This in the department discussion did important ideas the following own inside takes.

• X metric space and AX 's small package Let it be .

i . If x is every one neighbor is a point in A and a point in X \ A own inside If x ∈ X is a point A border point is considered .

ii. If x is every one its neighbor is different from x in A the point own inside If x is the point A, border point is considered .

iii. If a has N neighbors such that N ∩ A = {a} If , a ∈ A is a point of A isolated point is considered .

Border points and border points in the set A to be condition not , A 's isolated point and be in A A = (0, 1) ∪ {2} in = (R , dE) small package as 0 limit point , but is not an isolated point , but 2 is border point , but border point not . Also, the 0.5 limit point , but neither border , no isolated point. A discrete to the metric has R 's small package as ,

A 's every one point insulation point made , but in R no a point A border point or border point not . So so , every one border point border point or insulation Even though the point is made , three concept difference does .

• If X \ A is open collection If , X is a metric A small space package closed will be.

• Closed of collections limited associations closed when , closed of collections desired intersection closed will be .

• If in CY closed collection If , X is a metric Y metric from space function f on the space continuous will be (C) in X closed collection if .

• X metric space Let AX be small package let it be and x A 's border point Let . Then the sequence (an) that converges to x in A is there is .

• X metric space Let AX be small package let it be and x A 's border point Let . Then the sequences (xn) and (an) that converge to x in A are there is .

• X metric A small space of the collection limit A 's border points is a collection.

• X metric A small space package only A all border points own inside received just by chance closed will be .

Same so , A is only A itself all border points own inside received just by chance will be closed .

• X metric A small space of the collection all border points with set A′ is determined by . A 's closure A = A ∪ A′

is a set of . A 's closure of A in X own inside received the most small closed is a collection .

• X metric A small space set , if and only If lim an is in A , then (an) is in A convergent sequence when will be closed .

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