

Question 9

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let $A_n = (0, 1/n)$ we know that $(0, 1/(n+1)) \in (0, 1/n)$, therefore $A_{n+1} \subset A_n$

proposition: for $A_n = (0, 1/n)$, $\bigcap_1^\infty A_n = \emptyset$

proof: prove by contradiction.

1. assume there exists some element in the intersection. say, x (as A_n is an open interval).

we can prove x is not a member of the intersection.

2. for some N big enough. $1/N < x$. Therefore x did not lie in set A_N

3. However, $\bigcap_1^\infty A_n$ is a proper subset of A_N

4. and A_N is a proper subset of $(0, x)$

5. this means x is not in $\bigcap_1^\infty A_n$, contradiction.

conclusion: we proved $\bigcap_1^\infty A_n = \emptyset$ by contradiction