Consider the sequence of intervals $A_n = (0, \frac{1}{n})$
Claim 1: $A_{n+1} \subset A_n$
Proof:
Let $x \in A_{n+1}$
$\implies 0 < x < \frac{1}{n+1}$
$\implies 0 < x < \frac{1}{n}$ as $\frac{1}{n} > \frac{1}{n+1}$
$\implies x \in A_n$
$\implies A_{n+1} \subset A_n$
Claim2:- $\bigcap_{n=1}^{\infty} A_n = \phi$
proof :-
Let $\bigcap_{n=1}^{\infty} A_n \neq \phi$
$\implies \exists$ x $\in S = \bigcap_{n=1}^{\infty} A_n$
Since $x \in A_n$ $x > 0$
$\implies \exists\, n \in \mathbb{N}$ such that $x > \frac{1}{n}$ Archimedian Property
$\implies x \notin A_{n+1}$
$\implies x \notin S$
$\implies x \in S$ and $x \notin S$.
Which is a contradiction.
Hence $\nexists\, x$ such that $x \in \bigcap_{n=1}^{\infty} A_n$
$\implies \bigcap_{n=1}^{\infty} A_n = \phi$