

CONCEPT A limit is defined formally as the value that the function or sequence approaches as the input or index approaches the given value from both sides, but may not necessarily be equal to the function or sequence value at that point.

Limits are an essential concept in calculus, as they allow us to determine the behavior of a function or sequence around a given point, including whether it is continuous, differentiable, or has any discontinuities or singularities. They are used extensively to study derivatives, integrals, and other important mathematical concepts.

BACKGROUND

The concept of limits has a long and complex history, with contributions from mathematicians such as Archimedes, Cavalieri, Fermat, and Newton. The concept of limits was essential in the development of calculus, allowing mathematicians to define derivatives and integrals rigorously and provide a solid foundation for the subject.

REAL WORLD CONNECTIONS

One example of limits is the calculation of groundwater flow rates. Nebraska is a state with a large amount of agricultural activity, and much of the irrigation in the state is dependent on groundwater sources. To understand the behavior of groundwater flow in a particular aquifer, scientists and engineers use mathematical models that involve limits.

