A REPORT

ON

“Oscillatory Series”

Submitted in partial fulfilment of the
requirementsfor the Continuous Assessment (CA)

Submitted By

Sweety Acharjee, 15800121008

Department of Computer Science Engineering

Mallabhum Institute of Technology

Braja Radhanagar, P.O-Gossaipur

Bishnupur, Bankura

ACKNOWLEDGEMENT

I acknowledge all the faculty members of this institute for their constant encouragement, valuable suggestions and moral support to prepare this report on given subject topic. I am indeed proud and fortunate to be supported by corresponding subject teacher to complete this report.

Sweety Acharjee
15800121008

Table of Contents

- Introduction
- Definition of Oscillatory Series
- Examples
- References

Introduction

A series is an infinite addition of an ordered set of terms. The infinite series often contain an infinite number of terms and its nth term represents the nth term of a sequence. A series contain terms whose order matters a lot. If the terms of a rather conditionally convergent series are suitably arranged, the series may be made to converge to any desirable value or even to diverge according to the Riemann series theorem. Let the terms in a series be denoted by the symbol, a_n , and the nth partial summation be denoted using the following sigma notation for any natural number n

$$\sum_{n=0}^{\infty} an = a_0 + a_1 + a_2 + \cdots + a_n + \cdots$$

Series are two types –

1) Finite Series—

Series Is the sum of terms of a sequence of numbers. If (an) Is a sequence of numbers then the expression a1+a2+….+an is called finite series.

2) Infinite Series—

Infinite series, the sum of infinitely many numbers related in a given way and listed in a given order. For an infinite series $a_1 + a_2 + a_3 + \cdots$, a quantity $s_n = a_1 + a_2 + \cdots + a_n$, which involves adding only the first n terms, is called a partial sum of the series. For example, the nth partial sum of the infinite series $1 + 1 + 1 + \cdots$ is n.

Infinite Series are three types—

1. Convergent series
2. Divergent series
3. Oscillatory series

- **Convergent Series—**

A series is **convergent** (or **converges**) if the sequence($S_1,S_2,S_3,\ldots\ldots$) of its partial sums tends to a limit; that means that, when adding one a_k after the other *in the order given by the indices*, one gets partial sums that become closer and closer to a given number.

Example:

- **Divergent Series—**

A **divergent series** is a series whose partial sums, by contrast, don't approach a limit. Divergent series typically go to ∞, go to −∞, or don't approach one specific number.

Example:

- **Oscillatory Series:**

A series that is divergent but not properly divergent; that is, the partial sums do not approach a limit, or become arbitrarily large or arbitrarily small.

Example:

Consider the series 1-1+1-1+1-1…. upto infinity= $\sum_{n=1} (-1)^{n-1}$

Hare, unfortunately = (-1) ^n-1. So the partial Sum,

$S_n=u_1+u_2+\ldots\ldots +u_n=1-1+1-1+1\ldots$ to n terms
=0 or 1 According as n is even or odd.

So, the sequence of partial sums is {1,0,1,0, 1,…..}.

Hence the sequence {Sn} oscillates finitely.

Thus, the series is Oscillatory.

Reference:

https://en.wikipedia.org/wiki/Oscillation_(mathematics)

https://math.stackexchange.com/questions/1784502/oscillates-and-diverges

https://testbook.com/question-answer/series-1-r-r2-r3-is--602b506d0db4fdaec2f7acb6