

Study ON CERTAIN CONDITIONALLY CONVERGENT SERIES

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Abstract. In this paper we investigate the problem of the convergence of a very special kind of non absolutely convergent series which can not be solved by means of traditional tests as Dirichlet test.



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1. INTRODUCTION

We investigate the behavior of the series

$$\sum_{n=0}^{+\infty} (-1)^{n \pmod{p}} a_n.$$

where p is an odd prime number and a_n is not negative for each n . We could call 'almost alternating series' because the sequence of the signs is of the kind

$$+ \underbrace{- \dots -}_{p\text{-terms}} \underbrace{+ \dots +}_{p\text{-terms}} - \dots - + \dots$$

We observe that the Dirichlet's test is not applicable even in the case of further assumptions on a_n because the partial sums of the sequence $b_n = (-1)^{n \pmod{p}}$ are not bounded. Indeed, if we indicate with σ_n the sequence of this partial sums we have that $\sigma_{pk} = k + 1$.

2. THE THEOREM

Lemma 1. Let be

$$\sum_{n=0}^{+\infty} (-1)^{n \pmod{p}} a_n.$$

where

(a): $a_n \geq 0$ for each $n \in \mathbb{N}$.

(b): $\sum_{n=0}^{+\infty} a_n = +\infty$.

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