

New forms of the Taylor's remainder

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Abstract

We present two new forms of the remainder in Taylor's formula involving a generalization of the Taylor-Lagrange formula. An asymptotic formula of the Taylor's remainder for real analytic functions is given as application.

Keywords : *Taylor's remainder, harmonic alternating series, real analytic functions.*

1. Introduction

Let us denote by $(\{c, d\})$ the open interval $(\min\{c, d\}, \max\{c, d\})$, and by $[\{c, d\}]$ the closed interval $[\min\{c, d\}, \max\{c, d\}]$ for all $c, d \in \mathbb{R}$ with $c \neq d$.

The most popular forms of remainder in Taylor's formula are the classical well known integral, Lagrange's and the Cauchy's forms of remainder. The Lagrange's and Cauchy's forms are special cases of the Schloemilch-Roeche's remainder:

Theorem 1. *Let $a, b \in \mathbb{R}$ such that $a \neq b$. Let $f : [\{a, b\}] \rightarrow \mathbb{R}$ be a mapping, such that $f \in C^n([\{a, b\}])$, $f^{(n+1)}$ exists on $(\{a, b\})$ and $f^{(n+1)}(t) \neq 0$ for*

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