

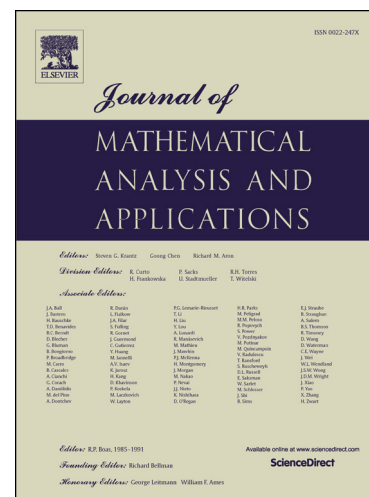
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On a Relation Between Boundedness and Degree Boundedness of a Sequence of Polynomials*

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Abstract. Our aim in this article is to show that under some conditions, a sequence $\{f_n\}$ of polynomials in $\mathbb{R}[x]$ is bounded on $[a, b]$ only if the sequence $\{\deg(f_n)\}$ of their degrees is unbounded. As an application of this we will then prove that for some families of polynomial functions $y = f(x)$ there exists a vertical strip containing no maxima points of the $y = |f(x)|$ functions.

1 Introduction

Let $\{f_n\}$ be a sequence of polynomials in $\mathbb{R}[x]$. In general there is no relation between the (point-wise) boundedness of this sequence on some interval I and the boundedness of the sequence $\{\deg(f_n)\}$ of their degrees. However, we will see that there would be such a relation if some conditions, as introduced in the following definition, hold.

Definition 1.1. Let the distinct points $A, Q \in \mathbb{R}^2$ lie on a vertical line (i.e., they have the same x -coordinates) and $\{Q_n\}$ be a sequence of points in $\mathbb{R}^2$ having Q as a limit point. Then a sequence $\{f_n\}$ of polynomials in $\mathbb{R}[x]$ is called "an associated sequence of polynomials" if for each positive integer n , the graph of f_n goes through both A and Q_n .

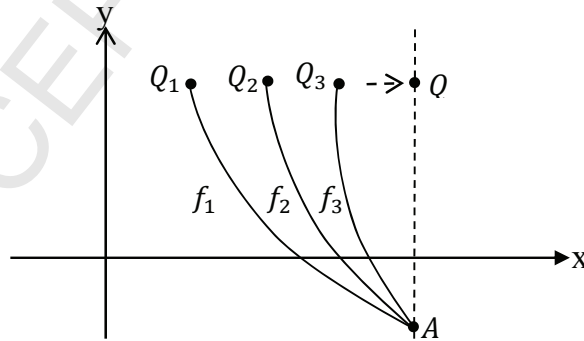


Figure 1. An Associated Sequence of Polynomials

In section 2 of the article we will prove our main result:

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Key words and phrases. Degree boundedness, (point-wise) boundedness, maximum point.

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