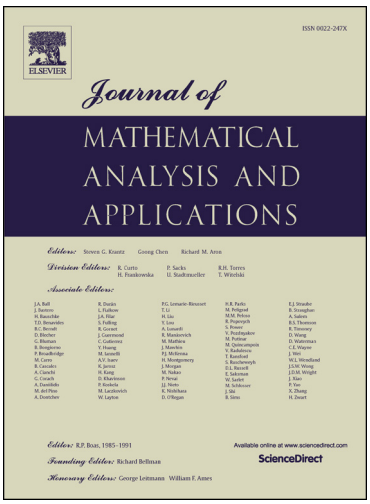
Accepted Manuscript



On a relation between boundedness and degree boundedness of a sequence of polynomials

Mahdi Zekavat

PII: S0022-247X(16)30478-4
DOI: http://dx.doi.org/10.1016/j.jmaa.2016.08.046
Reference: YJMAA 20682

To appear in: *Journal of Mathematical Analysis and Applications*

Received date: 17 December 2015

Please cite this article in press as: M. Zekavat, On a relation between boundedness and degree boundedness of a sequence of polynomials, *J. Math. Anal. Appl.* (2016), http://dx.doi.org/10.1016/j.jmaa.2016.08.046

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

Mahdi Zekavat

I. A. Univ. of Estahban

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.*

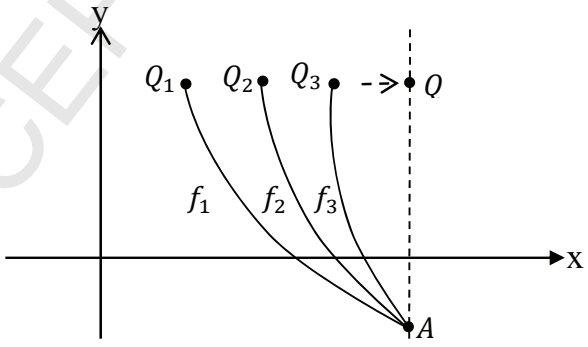


Figure 1. An Associated Sequence of Polynomials

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

---

* 2010 *Mathematics Subject Classification.* 26C05, 12E99, 40A05.
Key words and phrases. Degree boundedness, (point-wise) boundedness, maximum point.
This research was supported by a grant from the I. A. Univ. of Estahban.