REVIEW

By Prof. Boyan Georgiev Zlatanov, Dr.Sci.

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On a work for obtaining a PhD degree; on Research area: 4. Natural sciences, mathematics and informatics, Professional field 4.5. Mathematics (Mathematical analysis) PhD program "Mathematical Analysis" at the Faculty of Mathematics and Informatics (FMI) at Plovdiv University Paisiy Hilendarski (PU) with an author: Plamena Ivanova Marcheva; thesis title: Fixed points and convergence of iteration methods for simultaneous approximation of polynomial zeros.

By order No. RD-21-431 dated 23.02.2023 of the rector of PU, I was appointed as a member of the scientific jury to ensure a procedure for the defense of the above mentioned PhD thesis. At the first meeting of the jury, I have been chosen to present an opinion.

In accordance with the Rules of Procedure for the Development of the Academic Staff of the PU, the dissertation candidate has submitted the complete set of documents, which includes:

1. application form to the Rector for opening a procedure
2. CV in European format
3. protocol of the preliminary discussion in the department
4. abstracts of the work in a volume of 32 pages, in Bulgarian and the language traditionally used in the relevant scientific field.
5. declaration of originality and authenticity of the attached documents
6. certificate of compliance with the minimum national requirements;
7. list of publications
8. dissertation work
9. copies of the publications on the subject of the dissertation. The applicant has

The dissertation is based on 3 publications, of which 2 are in journals indexed in SCOPUS and WoS and one outside the mentioned databases. Two of the publications are conference reports, which are regular and classified as periodical publications. One publication is in a journal with Q2 and the other in a conference with SJR. This quick review shows that Plamena Marcheva satisfies the formal minimum national requirements for obtaining the PhD degree on Research area: 4. Natural sciences, mathematics and informatics, Professional field 4.5. Mathematics (Mathematical analysis).

The dissertation submitted for defense is 117 pages long, consists of Notations, Introduction, four chapters, conclusion and bibliography of 108 titles.

The main research in the dissertation is devoted to approximation of the zeros of a polynomial using fixed points. The main directions are within the field of local and semi-local convergence along with error estimation and asymptotic constant estimation of some of the known methods for approximating the zeros of polynomials (modified Weierstrass method, Dochev-Burnev method). The obtained results improve and complement those known to date in the literature. A theoretical

and numerical comparison is made between the modified and classical Weierstrass methods. In chapter four, the possibility of improving the speed of convergence when approximating the zeros of a polynomial using the combination of two iteration functions is investigated. Cases for the Weierstrass, Newton, Ehrlich, and Halley functions are considered. Sufficient conditions for local and semi-local convergence of the studied methods were found. A large part of the results are illustrated with numerical examples.

In the conclusion, the contributions in the presented dissertation work are correctly described.

From the preliminary defense, I believe that the doctoral student is familiar with the subject of the dissertation work.

The main apparatus of conducting research in the dissertation work is the theory of fixed points for contractive type of maps when approaching the zeros of a polynomial.

The results have been presented at four scientific forums. The results are part of the research of a scientific project at the "Scientific Research" Fund.

The abstract correctly systematizes the results of the dissertation.

I have not found "plagiarism" in the works of the candidate in the sense of the "Law on the Development of the Academic Staff in the Republic of Bulgaria" in the Republic of Bulgaria.

CRITICAL NOTES

I have no critical notes on the layout and the results obtained.

CONCLUSION

In my opinion the candidate Plamena Marcheva has obtained enough results both in quality and quantity. The presented documents meet the requirements, conditions and criteria of the Law on the Development of the Academic Staff in the Republic of Bulgaria, Rules for applying of the mentioned above law, Rules for the conditions and order for acquiring academic degrees and academic positions at University of Plovdiv Paisii Hilendarski to get a PhD degree on Research area: 4. Natural sciences, mathematics and informatics, Professional field 4.5. Mathematics (Mathematical analysis). Therefore, I give my strictly positive assessment and recommend that the scientific jury to award the PhD degree to Plamena Ivanova Marcheva in Research area: 4. Natural sciences, mathematics and informatics, Professional field 4.5. Mathematics (Mathematical analysis).

09.03.2023   Signature: ....
                                                    /Prof. Boyan Zlatanov, Dr.Sci/