



Dear Colleagues!

Institute of Mathematics of the University of Georgia is pleased to invite you to the Online Tbilisi Analysis & PDE Seminar. The seminar is held bi-weekly on Tuesdays at 20 : 00 local time in Tbilisi.

Talk on May 30, 2023

Speaker: Prof. Harm Bart, Erasmus University Rotterdam;

<https://www.researchgate.net/scientific-contributions/Harm-Bart-2013767776>

"The Rouché Theorem for Fredholm operator valued functions: an enhanced version"

Abstract: The well-known classical Rouché Theorem is concerned with the perturbation of scalar analytic functions. Roughly speaking: if the perturbation is small enough, the perturbed function has the same number of zeros as the original one. In the 1971 paper [GS], I.C. Gohberg and E.I. Sigal generalized the theorem to a result involving Fredholm operator valued functions. Although just one of them is indicated in [GS] (and in [GGK], Section XI.9 as well), there are actually two versions of the generalization, due to the fact that bounded linear operators as a rule do not commute. So a commutativity issue manifests

itself here.

There is another one. The Rouché Theorems involve the logarithmic residues of the functions involved, i.e., a contour integral of their logarithmic derivatives. In the scalar case such a logarithmic is unambiguously determined; in the non-scalar setting it is not. There, again, two possibilities present themselves, depending on which order one takes in the product of the derivative and the inverse. Generally these options do not come down to the same.

In the lecture, an approach will be presented which yields an encompassing (strictly) stronger variant of the results indicated above.

[GS] I.C. Gohberg, E.I. Sigal, An operator generalization of the logarithmic residue theorem and the theorem of Rouché, *Mat. Sbornik* 84 (126) (1971), 607-629 (Russian), English Transl. in: *Math. USSR Sbornik* 13 (1971), 603-625.

[GGK] I. Gohberg, S. Goldberg, M.A. Kaashoek, *Classes of Linear Operators, Vol. I*, Operator Theory: Advances and Applications, OT 49, Birkhäuser Verlag, Basel 1990.

Date: May 30, 2023

Time: 20 : 00 local time in Tbilisi;

(Compare to your local time: <https://www.timeanddate.com/worldclock/georgia/tbilisi>);

How to join: The seminar is organized on the **Cisco Webex Meetings**. If you are already registered, you do not need to register again. Otherwise, to join the seminar please send an e-mail to seminarim@ug.edu.ge or register here:

<https://forms.gle/xfQJ9fg1uqe7CrZw6>

You will then receive further information.

WEB of Seminar: <https://www.ug.edu.ge/en/tbilisi-analysis-and-pde-seminars>

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