PHENIKAA UNIVERSITY
FACULTY OF FUNDAMENTAL SCIENCES
Department of Mathematics

2024 PHENIKAA Autumn Math-Workshop

Hanoi, October 11, 2024

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PROGRAM AND ABSTRACTS

Hanoi, October 11, 2024

Sponsor

Faculty of Fundamental Sciences,
PHENIKAA University

Organizing Committee

- Phan Quang Sang, PHENIKAA University, *Chair*
- Bui Xuan-Quang, PHENIKAA University, *Secretary*

Time and Venue

- 08:30–12:00, October 11, 2024
- 24th Floor, A9 Building, PHENIKAA University

Contact

Bui Xuan-Quang

e-mail: quang.buixuan@phenikaa-uni.edu.vn

PROGRAM

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Chair: Dr. Phan Quang Sang

8:45 – 9:00 Welcome speech

Chair: Dr. Vu Huu Nhu

9:00 – 9:40 **Nguyen Hong Duc**
Limits of real bivariate rational functions

9:40 – 10:00 *Tea break & Photo session*

Chair: Dr.habil. Duong Ngoc Son

10:00 – 10:40 **Nguyen Thi Ngoc Giao**
On the classification of cubic planar Cremona maps

10:40 – 11:10 **Tran Quang Tue**
Orlik-Solomon algebra of a hyperplane arrangement

ABSTRACTS

Limits of real bivariate rational functions

Nguyen Hong Duc[1]

Abstract: Given two nonzero polynomials $f, g \in \mathbb{R}[x, y]$ and a point $(a, b) \in \mathbb{R}^2$, we give some necessary and sufficient conditions for the existence of the limit

$$\lim_{(x,y)\to(a,b)} \frac{f(x,y)}{g(x,y)}.$$

We also show that, if the denominator g has an isolated zero at the given point (a, b), then the set of possible limits of $\lim_{(x,y)\to(a,b)} \frac{f(x,y)}{g(x,y)}$ is a closed interval in $\mathbb{R}$ and can be explicitly determined. As an application, we propose an effective algorithm to verify the existence of the limit and compute the limit (if it exists). Our approach is geometric and is based on Puiseux expansions

[1] TIMAS, Thang Long University
Nghiem Xuan Yem, Hanoi, Vietnam
Email: duc.nh@thanglong.edu.vn, nhduc82@gmail.com

On the classification of cubic planar Cremona maps

Nguyen Thi Ngoc Giao[1]

Abstract: We are interested in the birational self-maps of the projective plane over the field $\mathbb{C}$ of complex numbers. Such a map will typically be denoted by $f\colon \mathbb{P}^2 \dashrightarrow \mathbb{P}^2$ and it is called plane Cremona map. The set of all plane Cremona maps forms a group and is called the plane Cremona group $\mathrm{Bir}(\mathbb{P}^2)$. Generators of $\mathrm{Bir}(\mathbb{P}^2)$ have been known for over a century now, by the Theorem of Noether and Castelnuovo. Nonetheless, the plane Cremona group is currently still a very active research area. In particular, many results related to its subsets, that are, the sets of all plane Cremona maps of fixed degrees, have been achieved. Studying these objects is a challenge even if they are of small degrees. In this talk, I focus on the classification of cubic planar Cremona maps (that are the Cremona maps of degree 3), up to automorphisms of the plane. To do so, we introduce a new discrete invariant for cubic planar Cremona maps, called enriched weighted proximity graph, which encodes some properties of the base locus of the Cremona map. This is a joint work with Alberto Calabri.

[1] Faculty of Advanced Science and Technology
University of Science and Technology
The University of Da Nang
54 Nguyen Luong Bang, Da Nang, Vietnam
Email: ngocgiao185@gmail.com

Orlik-Solomon algebra of a hyperplane arrangement

Tran Quang Tue[1]

Abstract: We introduce the notion of Orlik-Solomon algebra of a hyperplane arrangement and explain why the cohomology of a hyperplane arrangement complement is a combinatorial invariant.

[1] Faculty of Fundamental Sciences, PHENIKAA University
Hanoi 12116, Vietnam
Email: tue.tranquang@phenikaa-uni.edu.vn