Nobody Solves the Quintic Web Site

There is a truly lovely and relatively easy topological proof of one of the most fundamental results of Galois theory, that there isn't a "formula" for solving equations of degree 5 and up. I have given talks to explain that proof (e.g., https://www.math.toronto.edu/~drorbn/Talks/Sydney-1708 and https://www.math.toronto.edu/~drorbn/Talks/CMU-1504/) and they are on video. But the animations I have used are clunky and need to be modernized. Would you be interested in doing that?

At minimum you will need to re-implement the animations in my talks so as to run stably within a web browser. Even better if you will be able to add and improve, perhaps making it into a full web site explaining and exploring the proof.

Requirements. You must learn and feel fully comfortable with the proof and you must care for presentation. You must feel comfortable with graphics programming.

Warning. There is a fair chance that I will be away for a good portion of the summer, or possibly even for all of it. So much of our communications will have to occur over zoom.

Posted on November 4, 2024.

Status. Not assigned. If you are interested, see Summer Research Awards for Undergraduates on the math department web site.

Drawing Large Knots and Seifert Surfaces

The software I currently have for drawing large knots wastes a lot of real estate (e.g., https://drorbn.net/AcademicPensieve/Talks/UBC-241004/DK300SnapPyDiagram.pdf). It ought to be possible to do better! Would you try? As for Seifert surfaces, I don't even have a general program (though see some pictures and an illustration). Would you fix that?

Requirements. You must care for aesthetics and have ideas how to make it better. You must feel comfortable with graphics programming in Mathematica.

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Posted on November 4, 2024.

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Knot Families and their θ Invariant

The primary purpose of this project will be to code as many "families" of knots as you can identify in a way that will be clean and useful for others. A secondary purpose will be to compute the θ invariant of many knots in these families, in the hope of finding patterns and making conjectures. you may want to listen to my talk at http://drorbn.net/to24 to see what θ is about.

Examples of families: torus knots, pretzel knots, twisted torus knots arXiv:2411.13003, knots with diagonal grid diagrams arXiv:2412.13796, Montesinos knots, double-torus knots (Hirasawa, Murasugi), torti-rational knots, ...

Requirements. You must be excellent at combinatorial programming in Mathematica.

Warning. There is a fair chance that I will be away for a good portion of the summer, or possibly even for all of it. So much of our communications will have to occur over zoom.

Posted on November 4, 2024.

Status. Not assigned. If you are interested, see Summer Research Awards for Undergraduates on the math department web site.