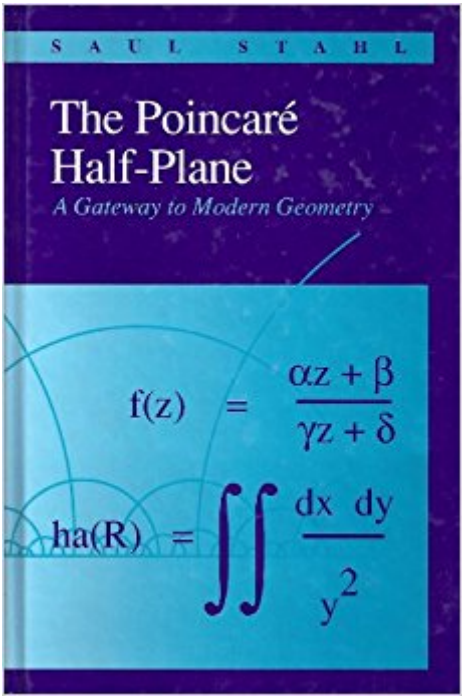
Poincare Half-Plane (Jones And Bartlett A Gateway To Modern Geometry)



Synopsis

In the 1880s, over fifty years after the discovery of the hyperbolic plane, Poincare pointed out that this plane provides a very useful context for describing the properties of the solutions of an important class of differential equations. Topics include Euclidean rigid motions, inversions, Euclidea

Book Information

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Customer Reviews

Thanks

This book is an elementary account of hyperbolic geometry. Aimed for undergraduate students, it introduces readers to the subject with very concrete examples assuming the prerequisite of only one semester level of calculus. It also describes the history of Euclidean and non-Euclidean geometry and concerns about the birth background of hyperbolic geometry and the differences between Euclidean, hyperbolic, and spherical geometries. It really helped me to understand the differences. For that, I appreciate the author.In the case that you use this book for self-study, I believe that you can finish this book within three weeks. During the three weeks, there may be some distractions like attending seminars and meeting people, but to do that, reading the book should be the most important thing. For that, to me, the most difficult part was Chapter 1. What I mean is that the decision as to what propositions I invest my time and attention was difficult upon reading the first chapter. If you read all propositions and each of its proofs, you will never finish it within that period. For example, I don’t think you need to check all the details of the proof of trigonometry of hyperbolic

geometry. Just taking a glance would suffice. And also, I don’t think you need to take the time to prove formally that a rotation in the Euclidean plane is a Euclidean rigid motion. If you can understand, then you don’t need formal proof. Your choice of what to carefully read depends on the reason why you read this book. Taking it as the axis of reading, you have to choose what you give your time to. For me, the reason was that I am interested in hyperbolic structure of three dimensional manifolds, although it is not exactly my research area, and I heard of hyperbolic geometry many times, so I wanted to know it better from scratch including its history and its relation to Euclidean and spherical geometries.Now I’d like to make some specific comments on this book.1. There are some typos in equations, in formulas, and in numbering the propositions.2. Again, the examples are very concrete and helpful. This is one of the best merits of this book.3. Another merit of the book is that it introduces length and area of the hyperbolic plane by some logical reasoning, comparing with Euclidean geometry, not just by defining the length and area using integral as many other text books do.4. There are some confusing parts. I couldn’t understand the story about a person named Polaris in Chapter 12. The proofs of Euclid’s propositions of Chapter 1 is a little bit confusing also. I think the latter is due to the disharmony of trying to prove Euclid’s propositions as Euclid did in Elements, although we already know that his proof are not perfect. But I think this can be corrected. I hope this would be improved in the next edition of the book.5. In Chapter 4, the author starts with defining hyperbolic distance using calculus. I don’t like the way the author deal with it like with the expression (dx)^2+(dy)^2. If you are also uncomfortable with it, like I was, then the book, Low-Dimensional Geometry by Francis Bonahon will be a great help for you.6. The exercises from Chapter 2 to Chapter 9 are worth trying. Doing three or four exercises will be good for you. After Chapter 10, even if you skip all the exercises, there seems to be no problem to understand the book.7. I skipped Chapter 14 because I couldn’t understand the first proposition of this chapter. But I don’t mind. After I read the book, I acquired the confidence that I can come back to this chapter any time the need arises, so it does not matter.8. The author avoids introducing the symbol 00 representing the infinity. I think there may be a reason the author did that, in my opinion, introducing it would have made many arguments much simpler.9. I find Chapter 12 unsatisfactory. The author induces the formula of Gaussian curvature for arbitrary Riemannian metric after an amount of argument, but I think that is not so helpful. It would have been better just to pose the formula and explain it in words rather than by equations.10. Chapter 13 was very interesting. The sections for the cross ratio and flow were exceptionally good. To enjoy this chapter, please always remember that the Moebius transformations send straight lines and circles to straight lines and circles.

This is the only book I've ever seen that makes the hyperbolic plane seem so natural and accessible. It takes ordinary Euclidean plane geometry as its basis, which allows the book to cover a lot of material in a very satisfying manner, without requiring advanced background like group theory or differential geometry. (In fact, the only background required is basically exposure to proofs, and occasionally a little calculus or linear algebra.) It's also extremely well-written, and the problems are well thought out. A great text for college juniors or seniors (or even advanced sophomores), and also great for self-study.

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