



Design and implementation of symbolic algorithms for the computation of generalized asymptotes

Marián Fernández de Sevilla¹ · Rafael Magdalena Benedicto² · Sonia Pérez-Díaz³

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Abstract

In this paper we present two algorithms for computing the *g-asymptotes* or *generalized asymptotes*, of a plane algebraic curve, \mathcal{C} , implicitly or parametrically defined. The asymptotes of a curve \mathcal{C} reflect the status of \mathcal{C} at points with sufficiently large coordinates. It is well known that an asymptote of a curve \mathcal{C} is a line such that the distance between \mathcal{C} and the line approaches zero as they tend to infinity. However, a curve \mathcal{C} may have more general curves than lines describing the status of \mathcal{C} at infinity. These curves are known as *g-asymptotes* or *generalized asymptotes*. The pseudocodes of these algorithms are presented, as well as the corresponding implementations. For this purpose, we use the algebra software `Maple`. A comparative analysis of the algorithms is carried out, based on some properties of the input curves and their results to analyze the efficiency of the algorithms and to establish comparative criteria. The results presented in this paper are a starting point to generalize this study to surfaces or to curves defined by a non-rational parametrization, as well as to improve the efficiency of the algorithms. Additionally, the methods developed can provide a new and different approach in prediction (regression) or classification algorithms in the machine learning field.

Sonia Pérez-Díaz, Marián Fernández de Sevilla and Rafael Magdalena Benedicto are contributed equally to this work.

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✉ Sonia Pérez-Díaz
sonia.perez@uah.es

Marián Fernández de Sevilla
marian.fernandez@uah.es

Rafael Magdalena Benedicto
rafael.magdalena@uv.es

- ¹ University of Alcalá, Department of Computer Science, Ctra. Madrid-Barcelona, km.33,6, Alcalá de Henares 28871, Madrid, Spain
- ² Department of Electronic Engineering, University of Valencia, Av. Universidades s/n, Burjassot 46100, Valencia, Spain
- ³ University of Alcalá, Department of Physics and Mathematics, Ctra. Madrid-Barcelona, km.33,6, Alcalá de Henares 28871, Madrid, Spain

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Table of Contents Design Implementation Of Symbolic Comp

1. Understanding the eBook Design Implementation Of Symbolic Comp
 - The Rise of Digital Reading Design Implementation Of Symbolic Comp
 - Advantages of eBooks Over Traditional Books
2. Identifying Design Implementation Of Symbolic Comp
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Design Implementation Of Symbolic Comp
 - User-Friendly Interface
4. Exploring eBook Recommendations from Design Implementation Of Symbolic Comp
 - Personalized Recommendations
 - Design Implementation Of Symbolic Comp User Reviews and Ratings
 - Design Implementation Of Symbolic Comp and Bestseller Lists
5. Accessing Design Implementation Of Symbolic Comp Free and Paid eBooks
 - Design Implementation Of Symbolic Comp Public Domain eBooks
 - Design Implementation Of Symbolic Comp eBook Subscription Services

- Design Implementation Of Symbolic Comp Budget-Friendly Options
- 6. Navigating Design Implementation Of Symbolic Comp eBook Formats
 - ePub, PDF, MOBI, and More
 - Design Implementation Of Symbolic Comp Compatibility with Devices
 - Design Implementation Of Symbolic Comp Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Design Implementation Of Symbolic Comp
 - Highlighting and Note-Taking Design Implementation Of Symbolic Comp
 - Interactive Elements Design Implementation Of Symbolic Comp
- 8. Staying Engaged with Design Implementation Of Symbolic Comp
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Design Implementation Of Symbolic Comp
- 9. Balancing eBooks and Physical Books Design Implementation Of Symbolic Comp
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Design Implementation Of Symbolic Comp
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Design Implementation Of Symbolic Comp
 - Setting Reading Goals Design Implementation Of Symbolic Comp
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Design Implementation Of Symbolic Comp
 - Fact-Checking eBook Content of Design Implementation Of Symbolic Comp
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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