

A system of differential equations is given as

$$\frac{dx}{dt} = 2x - 3y - 2 \quad (1)$$

$$\frac{dy}{dt} = x + y - 1 \quad (2)$$

Given that $x = 0$ and $y = 1$ when $t = 0$, find the particular solution to the system of differential equations.

$$\frac{dy}{dt} = x + y - 1$$

$$x = \frac{dy}{dt} - y + 1 \quad (3)$$

$$\frac{dx}{dt} = \frac{d^2y}{dt^2} - \frac{dy}{dt} \quad (4)$$

Sub (3) & (4) into (1)

$$\frac{d^2y}{dt^2} - \frac{dy}{dt} = 2\left(\frac{dy}{dt} - y + 1\right) - 3y - 2$$

$$\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 5y = 0$$

Auxiliary equation,
 $m^2 - 3m + 5 = 0$

$$m = \frac{3}{2} \pm \frac{i\sqrt{11}}{2}$$

General Solution

$$y = e^{\frac{3t}{2}} \left(A \cos \frac{\sqrt{11}}{2} t + B \sin \frac{\sqrt{11}}{2} t \right)$$

Modelling With Differential And Difference Equations

Ronald E Mickens



Modelling With Differential And Difference Equations:

Modelling with Differential and Difference Equations Glenn Fulford, Peter Forrester, Arthur Jones, 1997-06-12 Any student wishing to solve problems via mathematical modelling will find that this book provides an excellent introduction to the subject **Introduction to Differential and Difference Equations through Modeling** William P. Fox, Robert E. Burks, Jr., 2025-07-09 This book presents an opportunity to learn difference and differential equations through a modeling first approach The text is meant as an introduction to those equations and not as a text only for modeling courses No previous exposure to these equations is expected Modeling in Introduction to Differential and Difference Equations through Modeling is presented as the vehicle for learning difference and differential equations Although the topics in difference and differential equations are consistent with those in other textbooks this approach differs The presentation starts with a model or several models and offers the solution with minor discussions Then methods to obtain those solutions are presented and show these same models and others again in more detail This approach is designed to focus on the use of difference and differential equations to solve real world problems and to learn not only these primary topics but how to apply these through modeling The authors begin with a review of matrix algebra then an introduction to modeling The text progresses to discrete dynamical systems and then to the standard organization of most differential equation texts making the alignment with a current syllabus easier Technology is a significant modeling component Excel Python and Maple are presented as methods to solving the models This material has been class tested at the US Military Academy at West Point Marian University the College of William Mary and the Naval Postgraduate School with great success *Modelling with Differential and Difference Equations* P. Forrester, 1996 **Introduction to Differential and Difference Equations Through Modeling** William P. Fox, Robert Burks, 2025 This book presents an opportunity to learn difference and differential equations through a modelling first approach The text is meant as an introduction to those equations and not as a text only for modelling courses No previous exposure to these equations is expected Modeling is presented as the vehicle for learning difference and differential equations Although the topics in difference and differential equations are consistent with those in other textbooks this approach differs The presentation starts with a model or several models and presents the solution with minor discussions Then methods to obtain those solutions are presented and show these same models and others again in more detail This approach is designed to focus on the use of difference and differential equations to solve real world problems and to learn not only these primary topics but how to apply these through modeling The authors begin with a review of matrix algebra then an introduction to modelling The text progresses to Discrete Dynamical Systems and then to the standard organization of most DE texts making the alignment with a current syllabus easier Technology is a significant modeling component EXCEL Python and MAPLE are presented as methods to solve the models The material has been class tested at The US Military Academy at West Point Marion University and William and Mary and The Naval Postgraduate School with great success

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Differential Equations Courtney Brown, 2007-05-18 *Differential Equations A Modeling Approach* explains the mathematics and theory of differential equations Graphical methods of analysis are emphasized over formal proofs making the text even more accessible for newcomers to the subject matter

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Differential/Difference Equations Ioannis Dassios, Omar Bazighifan, Osama Moaaz, 2021-11-30

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Modeling Differential Equations in Biology Clifford Henry Taubes, 2008-01-17 Based on a very successful one semester course taught at Harvard, this text teaches students in the life sciences how to use differential equations to help their research. It needs only a semester's background in calculus. Ideas from linear algebra and partial differential equations that are most useful to the life sciences are introduced as needed and in the context of life science applications are drawn from real published papers. It also teaches students how to recognize when differential equations can help focus research. A course taught with this book can replace the standard course in multivariable calculus that is more usually suited to engineers and physicists.

Concepts of Mathematical Modeling Walter J. Meyer, 2004-01-01 Appropriate for undergraduate and graduate students, this text features independent sections that illustrate the most important principles of mathematical modeling, a variety of applications and classic models. The range of subjects includes topics from the physical, biological and social sciences as well as those of operations research. Exercises. 1984 edition.

Mathematical Modeling J. N. Kapur, 2023-02-15 This book can be used in courses on mathematical modeling at the senior undergraduate or graduate level or used as a reference for in-service scientists and engineers. The book provides an overview of mathematical modeling through a panoramic view of applications of mathematics in science and technology. In each chapter, mathematical models are chosen from the physical, biological, social, economic, management and engineering sciences. The models deal with different concepts but have a common mathematical structure and bring out the unifying influence of mathematical modeling in different disciplines.

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