



Cover Page of Book Maxima:

About Authors

Prof. Arun S. Pandhari has worked as P.G. Head of Mathematics at Tujaram Chaturchand College of Arts, Science and Commerce, Baramati (Pune). He has a long experience of 38 years of teaching Mathematics and Statistics from U. G. and P.G. classes. He is resident and past student of T.C. College. He did his M.Sc. from University of Pune, B.Ed. from Regional College of Education Bhopal. He stood first at B.Ed. He has Passed M.Ed., M.Phil from University of Pune. Has consistently first class career. His topics of interest are Pure Mathematics, Statistics and Education. He has written 20 textbooks at F.Y.B.Sc and B.C.S. students on Calculus, Algebra, Operation Research, etc. Published more than 30 articles in Marathi on various popular science subjects in Newspaper and in science magazines in Marathi. He has a long experience of working on various University/State Govt. Committees.



Prof. Shaila S. Jadhav is currently working as an Assistant Professor of Mathematics at Tujaram Chaturchand College of Arts, Science, and Commerce, Baramati (Pune). She has teaching experience of 12 years in B.Sc., B.Sc. (Computer Science), B.B.A., B.C.A., and M.Sc. (Maths). She has completed her M.Sc.(Maths) distinction with the first rank in the University of Pune. She has qualified SET Exam and now pursuing a Ph.D. She has presented her research papers at various National and International Conferences. This is her second book in Mathematics.




**F.Y.B.Sc.
Computer Science**


According to New CBCS Syllabus w.e.f. 2020-21

Mathematics using Maxima Software



MTC-111: Matrix Algebra
MTC-112 Discrete Mathematics





Arun S. Pandhari Shaila S. Jadhav




**ORDER
BOOKS
THROUGH
WHATSAPP**


Review us on


/visionpune




ISBN : 978-93-90046-71-5



₹255/-



VISION PUBLICATIONS
www.visionpune.com
info@visionpune.com



VISION

ISBN Number Page of Book Maxima:

Vision Publications titles are available at significant discounts when purchased in bulk for client gifts, sales promotion, and premiums. Special editions, including books with corporate logos, customized covers, as well as excerpts of existing books, can also be created in large quantities for special needs.

For details and discount information contact
visionpublications@gmail.com, Tel.: 8830238610



Head Office
Anand Bungalow, Road No. 10, Adarsh Colony, Tingrenagar. Pune-32.

Sales Office
39/1, Budhwar Peth, Appa Balwant Chowk, Pune - 2.
website: www.visionpune.com
email: visionpublications@gmail.com / info@visionpune.com

Book Title:
Mathematics using Maxima Software

Authors:
Arun S. Pandhari, Shaila S. Jadhav

Edition:
First: 2023

ISBN:
978-93-90646-71-5

© All rights reserved by Vision Publications. No part of this book is to be reproduced or transmitted in any form, Electronic, Mechanical, Photocopy or any information stored in a retrieval system without prior permission in writing, from Vision Publications, nor be otherwise circulated in any form of binding or cover other than that in which it is published without a similar condition being imposed on the subsequent purchaser.

Printer
Star Copiers, Budhwar Peth, Pune.

Note: Due care has been taken while editing, printing and binding of the book. Neither the editors nor publishers of the book hold any responsibility for any mistake that may have inadvertently crept in. If you notice any errors in the book and wish to report, please login to our website www.visionpune.com and write comments on this book on the site. You can search this book by entering Book ID mentioned below. Thank you.

1783

According to New CBCS syllabus w.e.f. 2019-2020

F.Y.B.Sc. & F.Y.B.Sc. Computer Science

Mathematics using Maxima Software

Arun S. Pandhari

M.Sc., M.Ed., M.Phil

(Ex.) HOD, P.G. Department of Mathematics,

T.C. College, Baramati.

Shaila S. Jadhav

M.Sc., Maths

Prof. Computer Science and Mathematics,

T.C. College, Baramati.

 **VISION PUBLICATIONS**
vision through

PREFACE

It is a matter of great pleasure for us to present this book on "Mathematics Practical on Maxima Software" to the students of F.Y. B.Sc. and F.Y. B.Sc. (Computer Science). This book is written according to the guidelines of the Board of Studies in Mathematics of SPPU.

Maxima Software is user friendly and easy to handle. It is a powerful tool to evaluate mathematical expressions. Maxima also provide command to representation of 2D and 3D graphs of various functions.

This book consists of detail solution of practical slips provided by Board of studies for F.Y. B.Sc. (Sem - I) and F.Y. B.Sc. Computer Science (Sem - I, Sem - II). Starting with basic commands, we covered the topics from Algebra, Calculus, Discrete Mathematics and Linear Algebra. We also demonstrate Discrete, Parametric, 2D and 3D graphs. Every maxima command explained with examples. A lot of examples of various types are solved in this book. The matter is presented in a simple and understandable manner.

We express our sincere thanks to entire team of Vision Publications for their valuable co-operation. We are thankful to the management of Anekant Education Society and our Principal Dr. C.V. Murumkar for continuous support. We are also thankful to Prof. Puranik S.R. (Head) and Colleague Prof. Shinde V.H.

We welcome any opinions and suggestions from all the readers.

Prof. A. S. Pandhari and Shaila S. Jadhav

 **VISION**

CONTENTS

1. Basics of Maxima Software		
1. Introduction	1-8	
2. History	1-11	
3. Applications	1-11	
4. Basic Commands	1-12	
		1-14
2. Algebra		
1. Introduction		2-60
		2-1
1.1 Polynomial	2-1	
1.2 Sets	2-3	
1.3 Function	2-14	
1.4 Inverse of a Function	2-22	
1.5 Basic Commands for Numbers	2-25	
1.6 Complex Number	2-26	
1.7 Divisibility in Integers	2-37	
1.8 Prime Numbers and the Theory of Congruence	2-41	
3. Plotting		3-30
1. Introduction		3-1
2. Plots in 2D		3-1
2.1 Discrete Plot and Parametric Plots	3-10	
2.2 Implicit plots	3-16	
2.3 Contour Plots	3-22	
3. Plots in 3D		3-24
4. Calculus		4-44
1. Real Numbers		4-1
2. Limit		4-5
3. Continuous Function		4-21
4. Sequences and its Plotting		4-27

5. Discrete Mathematics		5-40
1. Logic		5-1
2. Propositional Equivalence		5-5
3. Predicates, Assumptions and Facts		5-7
4. Boolean Algebra		5-9
4.1 Graph	5-9	
4.2 Boolean Variables and Boolean Functions	5-21	
4.3 Representation of Boolean Functions	5-23	
4.4 Simplification of Boolean Expression	5-26	
5. Counting Principles		5-27
6. Recurrence Relation		5-34
6.1 Linear Homogeneous Recurrence Relation	5-34	
6.2 Linear Non Homogeneous Recurrence Relation	5-37	
6. Matrices and Linear Algebra		6-16
1. Introduction		6-1
2. Matrices		6-2
2.1 Algebra of Matrices	6-3	
2.2 Operations on Matrices	6-4	
2.3 Column Space, Null Space, Rank and Nullity	6-12	
2.4 Echelon form of Matrix	6-13	

