Pure Mathematics 1

CIE AS Level Mathematics (9709)

Paper 1

Quadratics

Completing the square

Used to find **maximum or minimum values (vertex)** of quadratic equations, change or simplify algebraic expressions, **line of symmetry**, and solving quadratic equations.

$$x^2 + bx = (x + \frac{b}{2})^2 + (\frac{b}{2})^2$$

▼ example

$y = x^2 - 6x + 8$

$y = (x - 3)^2 - 1$

vertex: (3,-1)

line of symmetry: x = 3

Discriminants

Used to determine **how many point(s) intersects the x-axis** and the nature of the roots.

Point(s) that intersects the x-axis (x-intercepts) is called **roots** .

(1 real root → 1 point intersect the x-axis).

$$b^2 - 4ac$$
$$b^2 - 4ac > 0 \rightarrow \text{2 real and distinct roots}$$
$$b^2 - 4ac = 0 \rightarrow \text{1 real root (2 roots are real and equal)}$$
$$b^2 - 4ac < 0 \rightarrow \text{no real root}$$

Quadratic formula

Used to find the **value of the roots (x-intercepts)** in quadratic equations.

Use discriminants to know how many x-intercept(s) are there and find those x-intercept(s) using the quadratic formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Maximum and minimum values of a quadratic function

Use the '**a**' value in $ax^2 + bx + c$ to determine whether the graph has a minimum or maximum value.

Pure 1 Math November 2013

Yang-hui He

Pure 1 Math November 2013:

  Collected Papers. Volume VII Florentin Smarandache,2022-02-01 This seventh volume of Collected Papers includes 70 papers comprising 974 pages on theoretic and applied neutrosophics written between 2013 2021 by the author alone or in collaboration with the following 122 co authors from 22 countries Mohamed Abdel Basset Abdel Nasser Hussian C Alexander Mumtaz Ali Yaman Akbulut Amir Abdullah Amira S Ashour Assia Bakali Kousik Bhattacharya Kainat Bibi R N Boyd mit Budak Lulu Cai Cenap zel Chang Su Kim Victor Christianto Chunlai Du Chunxin Bo Rituparna Chutia Cu Nguyen Giap Dao The Son Vinayak Devvrat Arindam Dey Partha Pratim Dey Fahad Alsharari Feng Yongfei S Ganesan Shivam Ghildiyal Bibhas C Giri Masooma Raza Hashmi Ahmed Refaat Hawas Hoang Viet Long Le Hoang Son Hongbo Wang Hongnian Yu Mihaiela Iliescu Saeid Jafari Temitope Gbolahan Jaiyeola Naeem Jan R Jeevitha Jun Ye Anup Khan Madad Khan Salma Khan Ilanthenral Kandasamy W B Vasantha Kandasamy Darjan Karaba evi Kifayat Ullah Kishore Kumar P K Sujit Kumar De Prasun Kumar Nayak Malayalan Lathamaheswari Luong Thi Hong Lan Anam Luqman Luu Quoc Dat Tahir Mahmood Hafsa M Malik Nivetha Martin Mai Mohamed Parimala Mani Mingcong Deng Mohammed A Al Shumrani Mohammad Hamidi Mohamed Talea Kalyan Mondal Muhammad Akram Muhammad Gulistan Farshid Mofidnakhaei Muhammad Shoaib Muhammad Riaz Karthika Muthusamy Nabeela Ishfaq Deivanayagampillai Nagarajan Sumera Naz Nguyen Dinh Hoa Nguyen Tho Thong Nguyen Xuan Thao Noor ul Amin Dragan Pamu ar Gabrijela Popovi S Krishna Prabha Surapati Pramanik Priya R Qiaoyan Li Yaser Saber Said Broumi Saima Anis Saleem Abdullah Ganeshsree Selvachandran Abdulkadir Seng r Seyed Ahmad Edalatpanah Shahbaz Ali Shahzaib Ashraf Shouzhen Zeng Shio Gai Quek Shuangwu Zhu Shumaiza Sidra Sayed Sohail Iqbal Songtao Shao Sundas Shahzadi Dragi a Stanujki eljko Stevi Udhayakumar Ramalingam Zunaira Rashid Hossein Rashmanlou Rajkumar Verma Luige Vl d reanu Victor Vl d reanu Desmond Jun Yi Tey Sel uk Topal Naveed Yaqoob Yanhui Guo Yee Fei Gan Yingcang Ma Young Bae Jun Yuping Lai Hafiz Abdul Wahab Wei Yang Xiaohong Zhang Edmundas Kazimieras Zavadskas Lemnaouar Zedam

  Machine Learning In Pure Mathematics And Theoretical Physics Yang-hui He,2023-06-21 The juxtaposition of machine learning and pure mathematics and theoretical physics may first appear as contradictory in terms The rigours of proofs and derivations in the latter seem to reside in a different world from the randomness of data and statistics in the former Yet an often under appreciated component of mathematical discovery typically not presented in a final draft is experimentation both with ideas and with mathematical data Think of the teenage Gauss who conjectured the Prime Number Theorem by plotting the prime counting function many decades before complex analysis was formalized to offer a proof Can modern technology in part mimic Gauss s intuition The past five years saw an explosion of activity in using AI to assist the human mind in uncovering new mathematics finding patterns accelerating computations and raising conjectures via the machine learning of pure noiseless data The aim of this book a first of its kind is to collect research and survey articles from experts in this emerging dialogue between theoretical mathematics and machine learning It does not dwell on the well known

multitude of mathematical techniques in deep learning but focuses on the reverse relationship how machine learning helps with mathematics Taking a panoramic approach the topics range from combinatorics to number theory and from geometry to quantum field theory and string theory Aimed at PhD students as well as seasoned researchers each self contained chapter offers a glimpse of an exciting future of this symbiosis   <u>Trilogy Of Numbers And Arithmetic - Book 1: History Of Numbers And Arithmetic: An Information Perspective</u> Mark Burgin,2022-04-22 The book is the first in the trilogy which will bring you to the fascinating world of numbers and operations with them Numbers provide information about myriads of things Together with operations numbers constitute arithmetic forming in basic intellectual instruments of theoretical and practical activity of people and offering powerful tools for representation acquisition transmission processing storage and management of information about the world The history of numbers and arithmetic is the topic of a variety of books and at the same time it is extensively presented in many books on the history of mathematics However all of them at best bring the reader to the end of the 19th century without including the developments in these areas in the 20th century and later Besides such books consider and describe only the most popular classes of numbers such as whole numbers or real numbers At the same time a diversity of new classes of numbers and arithmetic were introduced in the 20th century This book looks into the chronicle of numbers and arithmetic from ancient times all the way to 21st century It also includes the developments in these areas in the 20th century and later A unique aspect of this book is its information orientation of the exposition of the history of numbers and arithmetic   *Mathematics and Computer Science, Volume 4* Biswadip Basu Mallik,Santanu Das,M. Niranjanamurthy,Sharmistha Ghosh,Krishanu Deyasi,2025-07-28 Mathematics and Computer Science for Real World Applications gives invaluable insights into how mathematical and computer sciences drive essential modern innovations that enhance everyday life making it a must read for anyone interested in the intersection of mathematics and technology and their real world applications Mathematical sciences are part of nearly all aspects of everyday life The discipline has underpinned beneficial modern capabilities including internet searches medical imaging computer animation numerical weather predictions and digital communication Mathematics and computer science are constantly evolving and contributing to most areas of science and engineering therefore future generations of mathematical scientists should reassess the increasingly cross disciplinary nature of the mathematical sciences Mathematics and Computer Science for Real World Applications presents current scientific and technological innovations from leading academics researchers and experts across the globe in mathematical sciences and computing The volume will discuss new technical ideas and features that can be incorporated into day to day life for the benefit of society A diversified spectrum of scientific advancements is discussed including applications of differential and integral equations computational fluid dynamics nanofluids network theory and optimization control theory machine learning and artificial intelligence Readers will explore diverse ideas and innovations in the field of computing and its growing connections to various fields of mathematics   *Geometric Methods in Physics* Piotr

Kielanowski,Pierre Bieliavsky,Anatol Odzijewicz,Martin Schlichenmaier,Theodore Voronov,2015-09-21 This book presents a selection of papers based on the XXXIII Bia owie a Workshop on Geometric Methods in Physics 2014 The Bia owie a Workshops are among the most important meetings in the field and attract researchers from both mathematics and physics The articles gathered here are mathematically rigorous and have important physical implications addressing the application of geometry in classical and quantum physics Despite their long tradition the workshops remain at the cutting edge of ongoing research For the last several years each Bia owie a Workshop has been followed by a School on Geometry and Physics where advanced lectures for graduate students and young researchers are presented some of the lectures are reproduced here The unique atmosphere of the workshop and school is enhanced by its venue framed by the natural beauty of the Bia owie a forest in eastern Poland The volume will be of interest to researchers and graduate students in mathematical physics theoretical physics and mathematmtics **Foliation Theory in Algebraic Geometry** Paolo Cascini,James McKernan,Jorge Vitório Pereira,2016-03-30 Featuring a blend of original research papers and comprehensive surveys from an international team of leading researchers in the thriving fields of foliation theory holomorphic foliations and birational geometry this book presents the proceedings of the conference Foliation Theory in Algebraic Geometry hosted by the Simons Foundation in New York City in September 2013 Topics covered include Fano and del Pezzo foliations the cone theorem and rank one foliations the structure of symmetric differentials on a smooth complex surface and a local structure theorem for closed symmetric differentials of rank two an overview of lifting symmetric differentials from varieties with canonical singularities and the applications to the classification of AT bundles on singular varieties an overview of the powerful theory of the variety of minimal rational tangents introduced by Hwang and Mok recent examples of varieties which are hyperbolic and yet the Green Griffiths locus is the whole of X and a classification of psuedoeffective codimension one distributions Foliations play a fundamental role in algebraic geometry for example in the proof of abundance for threefolds and to a solution of the Green Griffiths conjecture for surfaces of general type with positive Segre class The purpose of this volume is to foster communication and enable interactions between experts who work on holomorphic foliations and birational geometry and to bring together leading researchers to demonstrate the powerful connection of ideas methods and goals shared by these two areas of study div *Essays in Mathematics and its Applications* Themistocles M. Rassias,Panos M. Pardalos,2016-06-14 This volume dedicated to the eminent mathematician Vladimir Arnold presents a collection of research and survey papers written on a large spectrum of theories and problems that have been studied or introduced by Arnold himself Emphasis is given to topics relating to dynamical systems stability of integrable systems algebraic and differential topology global analysis singularity theory and classical mechanics A number of applications of Arnold s groundbreaking work are presented This publication will assist graduate students and research mathematicians in acquiring an in depth understanding and insight into a wide domain of research of an interdisciplinary nature **Neutrosophic Sets**

and Systems, Vol. V Florentin Smarandache,Mumtaz Ali, This book is a collection of nine papers contributed by different authors and co authors listed in the order of the papers A A Salama O M Khaled K M Mahfouz M Ali F Smarandache M Shabir L Vladareanu S Broumi K Mondal S Pramanik I Arockiarani I R Sumathi M Eisa and I Deli In first paper the authors studied Neutrosophic Correlation and Simple Linear Regression The Generalization of Neutrosophic Rings and Neutrosophic Fields is proposed in the second paper Cosine Similarity Measure of Interval Valued Neutrosophic Sets is studied in third paper In fourth paper A Study on Problems of Hijras in West Bengal Based on Neutrosophic Cognitive Maps is introduced Similarly in fifth paper Neutrosophic Crisp Set Theory is discussed In paper six Interval Valued Fuzzy Neutrosophic Soft Structure Spaces are presented by the authors Soft Neutrosophic Bi LA Semigroup and Soft Neutrosophic N LA Semigroup is given in seventh paper Introduction to Image Processing via Neutrosophic Technique is given in paper eight In the last paper Neutrosophic Soft Multi Set Theory and Its Decision Making is presented by the authors <u>Finite Frame Theory: A Complete Introduction to Overcompleteness</u> Kasso A. Okoudjou,2016-07-13 Frames are overcomplete sets of vectors that can be used to stably and faithfully decompose and reconstruct vectors in the underlying vector space Frame theory stands at the intersection of many areas in mathematics such as functional and harmonic analysis numerical analysis matrix theory numerical linear algebra algebraic and differential geometry probability statistics and convex geometry At the same time its applications in engineering medicine computer science and quantum computing are motivating new research problems in applied and pure mathematics This volume is based on lectures delivered at the 2015 AMS Short Course Finite Frame Theory A Complete Introduction to Overcompleteness held January 8 9 2015 in San Antonio TX Mostly written in a tutorial style the seven chapters contained in this volume survey recent advances in the theory and applications of finite frames In particular it presents state of the art results on foundational frame problems and on the analysis and design of various frames mostly motivated by specific applications Carefully assembled the volume quickly introduces the non expert to the basic tools and techniques of frame theory It then moves to develop many recent results in the area and presents some important applications As such the volume is designed for a diverse audience including researchers in applied and computational harmonic analysis as well as engineers and graduate students **Mathematics Without Boundaries** Themistocles M. Rassias,Panos M. Pardalos,2014-09-17 The contributions in this volume have been written by eminent scientists from the international mathematical community and present significant advances in several theories methods and problems of Mathematical Analysis Discrete Mathematics Geometry and their Applications The chapters focus on both old and recent developments in Functional Analysis Harmonic Analysis Complex Analysis Operator Theory Combinatorics Functional Equations Differential Equations as well as a variety of Applications The book also contains some review works which could prove particularly useful for a broader audience of readers in Mathematical Sciences and especially to graduate students looking for the latest information *Collected Papers. Volume X* Florentin Smarandache,2022-06-01 This tenth volume of

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computation to the physical universe Our theories deliver computational descriptions but the gaps and discontinuities in our grasp suggest a need for continued discourse between researchers from different disciplines and this book is unique in its focus on the mathematical theory of incomputability and its relevance for the real world The core of the book consists of thirteen chapters in five parts on extended models of computation the search for natural examples of incomputable objects mind matter and computation the nature of information complexity and randomness and the mathematics of emergence and morphogenesis This book will be of interest to researchers in the areas of theoretical computer science mathematical logic and philosophy **IAENG Transactions on Engineering Sciences** Sio-Iong Ao,Alan Hoi-Shou Chan,Hideki Katagiri,Li Xu,2014-04-07 Two large international conferences on Advances in Engineering Sciences were held in Hong Kong March 13 15 2013 under the International MultiConference of Engineers and Computer Scientists IMECS 2013 and in London U K 3 5 July 2013 under the World Congress on Engineering 2013 WCE 2013 respectively IMECS 2013 and WCE 2013 were organize

Bounded Gaps Between Primes Kevin Broughan,2021-02-25 A mathematical record of bounded prime gaps breakthroughs from Erd s to Polymath8 with linked computer programs and complete appendices Operations Research D S Hira,1992 The author have used numerical examples as the means for presentation of the underlying ideas of different operations research techniques Accordingly a large number of comprehensive solved examples taken from a variety of fields have been added in every chapter and they are followed by a set of unsolved problems with answers and hints wherever required through which readers can test their understanding of the subject matter The book in its present form contains around 650 examples 1 280 illustrative diagrams Web and Internet Economics Nikhil R. Devanur,Pinyan Lu,2017-11-24 This book constitutes the thoroughly refereed proceedings of the 13th International Conference on Web and Internet Economics WINE 2017 held in Bangalore India in December 2017 The 28 full and 6 short papers presented were carefully reviewed and selected from 89 submissions The papers reflect the work of researchers in theoretical computer science artificial intelligence and microeconomics who have joined forces to tackle problems at the intersection of computation game theory and economics **Multiresolution Approach to Processing Images for Different Applications** Igor Vujović,2014-12-27 This book presents theoretical and practical aspects of the interaction between low and high level image processing Multiresolution analysis owes its popularity mostly to wavelets and is widely used in a variety of applications Low level image processing is important for the performance of many high level applications The book includes examples from different research fields i e video surveillance biomedical applications EMG and X ray improved communication namely teleoperation telemedicine animation augmented virtual reality and robot vision monitoring of the condition of ship systems and image quality control

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