

Introduction

The aim of this investigation is to analyse a number of real polynomial functions through the various degrees, roots, turning points and the points of inflection. A polynomial is a function which consists of variables and coefficients, which are identified by its degree: 1, 2, 3, 4 and 5. They are written as: quadratic: $f(x) = ax^2 + bx + c$; cubic: $f(x) = ax^3 + bx^2 + cx + d$; and quartic: $f(x) = ax^4 + bx^3 + cx^2 + dx + e$, all $\neq 0$. Turning points are points on a graph where the graph changes direction from increasing to decreasing or decreasing to increasing. A point of inflection is the point where the concavity of the line changes, concave up or concave down. Roots are the variables used in the expression.

To undertake this investigation, a graphing package known as FX Graph will be used. The information obtained by the graph will be displayed in the tables written below, and will be split into three parts: **Part A**, **Part B** and **Part C**, each discussing different polynomials and their turning points, points of inflection and roots, and deciphering their conjectures. **Part A** will investigate polynomials with four distinct linear factors with the form $p(x) = a(x-\alpha)(x-\beta)(x-\gamma)(x-\delta)$ and polynomials with five distinct linear factors with the form $p(x) = a(x-\alpha)(x-\beta)(x-\gamma)(x-\delta)(x-\epsilon)$. A conjecture will be formed and supported by another investigated polynomial. **Part B** will investigate polynomials with a squared linear factor and two distinct linear factors with the form $p(x) = a(x-\alpha)^2(x-\beta)(x-\gamma)(x-\delta)$, and polynomials with a squared linear factor and three distinct linear factors with the form $p(x) = a(x-\alpha)^2(x-\beta)(x-\gamma)(x-\delta)(x-\epsilon)$; and a conjecture will be formed. To support this conjecture, another polynomial will be investigated. **Part C** will investigate several other possible combinations of factors for quartic polynomials and will include polynomials with a real quartic factor with complex conjugate roots.

Method

Using the FX Graph package, a number of polynomials were formed.

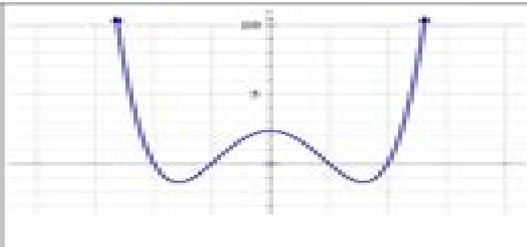
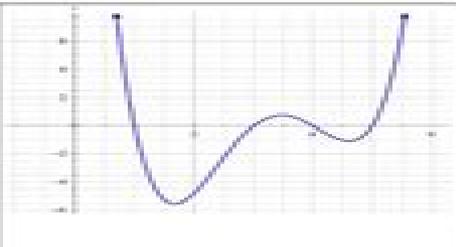
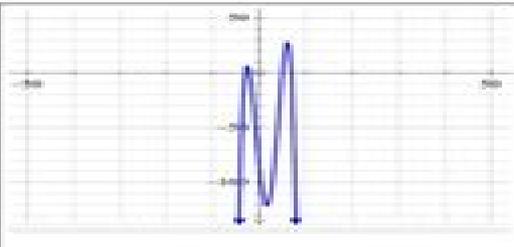
1. Download the FX Graph package.
2. Open the application.
3. Press the $y=$ button.
4. Enter the polynomial function, then press OK.
5. Zoom in or out, so you can see the entire polynomial.
6. Press WIN, shift, s.
7. Outline the area the polynomial covers and paste into the table on the document.

Part A

The investigation will start with polynomials with degree four. These polynomials with four distinct real linear factors have been graphed with the below form.

Table 1: Quartic Polynomials of the following form

$$p(x) = a(x - \alpha)(x - \beta)(x - \gamma)(x - \delta), a \neq 0.$$

Graph			
Function	$y=0.6(x+2)(x+1)(x-2)(x-2)$	$y=0.8(x-3)(x-4)(x-5)(x-1)$	$y=-0.4(x+2)(x+3)(x-5)(x-7)$
Roots	-2, -1, 1, 2	-5, -4, -3, -1	-5, -7, 2, 3
Turning points	3	3	3
Points of inflection	2	2	2

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Yu,Antoni Olivé**



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Intermediate Statistical Investigations Nathan Tintle, Beth L. Chance, Karen McGaughey, Soma Roy, Todd Swanson, Jill VanderStoep, 2020-09-09 Intermediate Statistical Investigations provides a unified framework for explaining variation across study designs and variable types helping students increase their statistical literacy and appreciate the indispensable role of statistics in scientific research Requiring only a single introductory statistics course as a prerequisite the program uses the immersive simulation based inference approach for which the author team is known Students engage with various aspects of data collection and analysis using real examples and clear explanations designed to strengthen multivariable understanding and reinforce first course concepts Each chapter contains in depth exercises which follow a consistent six step statistical exploration and investigation method ask a research question design a study explore the data draw inferences formulate conclusions and look back and ahead enabling students to assess a variety of concepts in a single assignment Challenging questions based on research articles strengthen critical reading skills fully worked examples demonstrate essential concepts and methods and engaging visualizations illustrate key themes of explained variation End of chapter investigations use real data from popular culture and published research studies in a variety of disciplines exposing students to various applications of statistics in the real world Throughout the text user friendly Rossman Chance web applets allow students to conduct the simulations and analyses covered in the book

Investigation of the Power of Some Language Constructs in

Programming Languages Louis E. Rosier, 1982 *Mathematical Investigations* Phil DeMarois, Mercedes A. McGowen, Darlene Whitkanack, 2001 Reflective of AMATYC and NCTM standards for teaching mathematics this text the first in a series of two texts aims to make mathematics truly accessible to all students by taking an active approach to learning Focused on mathematical reasoning and problem solving strategies Mathematical Investigations presents a series of carefully sequenced investigations where students gather data and work collaboratively to discover key concepts The function concept is central to all topics from Chapter 3 forward and is explored through multiple representations This text explores variables notation and processes explicitly rather than assuming students have mastered these concepts in previous courses Content is explored in depth and contextual problems are revisited throughout the text to create a spiral that gives students multiple opportunities to master important skills and concepts Graphing calculators are integrated throughout the text to help students discover patterns and interpret data intelligently Students construct their knowledge of a particular topic in a real world context and then reinforce this knowledge through reflection practice and synthesis with other topics as they work through the text *Abstract Algebra* Jonathan K. Hodge, Steven Schlicker, Ted Sundstrom, 2013-12-21 To learn and understand mathematics students must engage in the process of doing mathematics Emphasizing active learning Abstract Algebra An Inquiry Based Approach not only teaches abstract algebra but also provides a deeper understanding of what mathematics is how it is done and how mathematicians think The book can be used in both rings first and groups first

abstract algebra courses Numerous activities examples and exercises illustrate the definitions theorems and concepts Through this engaging learning process students discover new ideas and develop the necessary communication skills and rigor to understand and apply concepts from abstract algebra In addition to the activities and exercises each chapter includes a short discussion of the connections among topics in ring theory and group theory These discussions help students see the relationships between the two main types of algebraic objects studied throughout the text Encouraging students to do mathematics and be more than passive learners this text shows students that the way mathematics is developed is often different than how it is presented that definitions theorems and proofs do not simply appear fully formed in the minds of mathematicians that mathematical ideas are highly interconnected and that even in a field like abstract algebra there is a considerable amount of intuition to be found

Projects and Investigations Robert E. Vermillion,1991 The Shock and Vibration Digest ,1990 Computational Science -- ICCS 2005 V.S. Sunderam,G. Dick van Albada,Peter M.A. Sloot,Jack Dongarra,2005-05-04 The Fifth International Conference on Computational Science ICCS 2005 held in Atlanta Georgia USA May 22 25 2005 Mathematical Reviews ,2000 Problems for Student Investigation Mic B. Jackson,John R. Ramsay,1993 Calculus students should be expected to work on problems that require imagination outside reading and consultation cooperation and coherent writing They should work on open ended problems that admit several different approaches and call upon students to defend both their methodology and their conclusion Here is a source of 30 such projects p ix Conceptual Modeling - ER 2008 Qing Li,Stefano Spaccapietra,Eric Yu,Antoni Olivé,2008-10-13 Conceptual modeling has long been recognized as the primary means to enable software development in information systems and data engineering Conceptual modeling provides languages methods and tools to understand and represent the application domain to elicit conceptualize and formalize system requirements and user needs to communicate systems designs to all stakeholders and to formally verify and validate systems design on high levels of abstraction The International Conference on Conceptual Modeling provides a premiere forum for presenting and discussing current research and applications in which the major emphasis is on conceptual modeling Topics of interest span the entire spectrum of conceptual modeling including research and practice in areas such as theories of concepts and ontologies underlying conceptual modeling methods and tools for developing and communicating conceptual models and techniques for transforming conceptual models into effective implementations The scientific program of ER 2008 featured several activities running in parallel The core activity was the presentation of the 33 research papers published in this volume which were selected by a large Program Committee PC Co chaired by Qing Li Stefano Spaccapietra and Eric Yu We thank the PC Co chairs the PC members and the additional referees for the hard work done often within a short time Thanks are also due to Moira Norrie from ETH Zurich Oscar Pastor from the Universitat Politcnica de Valncia and Amit Sheth from the Wright State University for accepting our invitation to present keynotes

The Analyst ,1882 The Analyst publishes research articles in pure mathematics **Proceedings** ,1995

Orthogonal Polynomials and Their Applications Manuel Alfaro, 1988-07-13 The Segovia meeting set out to stimulate an intensive exchange of ideas between experts in the area of orthogonal polynomials and its applications to present recent research results and to reinforce the scientific and human relations among the increasingly international community working in orthogonal polynomials This volume contains original research papers as well as survey papers about fundamental questions in the field Nevai Rakhmanov L pez and its relationship with other fields such as group theory Koornwinder Pad approximation Brezinski differential equations Krall Littlejohn and numerical methods Rivlin **Quarterly Publication of the American Statistical Association** ,2005 ICDT '... ,2001 Journal of Dynamic Systems, Measurement, and Control ,1996 **Modern Structured Programming** Robin Schneyer,1984 *Glencoe Algebra 1* ,2001 **The Popular Science News and Boston Journal of Chemistry** ,1884 **Introductory and Intermediate Algebra** Margaret L. Lial,E. John Hornsby,Charles David Miller,1998

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