

POLYNOMIALS

ALL - IN - ONE

$$x^2 + 7x - 3$$
$$4a^3 + 7a^2 + a$$
$$nm^2 - m$$
$$3x - 2$$
$$5$$

Containing the
original power of the
Polynomial Arithmetic
Utility by ACagliano,
with additional
functions, and faster
algorithms.

By: Anthony Cagliano

Introduction

Polynomials All-In-One is a re-release of the *Polynomial Arithmetic Utility* (PAU) that I designed last year. I decided to go about making this program when a bug was discovered in the PAU. When I went to locate the bug and patch the program, I was baffled by how terribly coded it was. So, I decided to scrap the entire program and start over.

Installation

Luckily, this program requires no special installation. Just open your TI Connectivity Software of choice (be it TI Connect, TI Graphlink, or TiLp). Connect your calculator to your computer using the cable that came with your calculator. If you can't find this, any USB A to Mini B will work. Follow the procedures outlined in your connectivity software instructions for sending the program onto your calculator.

This program is compatible with the following calculator models:

- TI – 83+
- TI – 83+ SE
- TI – 84+
- TI – 84+ SE
- TI – 84+ emulator on the TI-Nspire

Once the program is successfully transferred, you can run it by selecting it from the Program menu, accessed by pressing the [PRGM] key. Scroll down until you see the program titled **POLYAOI**, and then select it with the cursor and press [ENTER]. The following line should appear on your home screen: *prgmPOLYAOI*. Press [ENTER] again to run the program.

Working this Program

Working with this program is fairly easy. Once you bypass the splash screen (which you do by pressing [ENTER], you are presented with a menu. To select a menu option, you can press the number key that corresponds to the entry that you want. Alternatively, you can press the right or left arrow keys to toggle the menu to the next menu. There are two menus. The first is a collection of algebra-related functions: polynomial addition, subtraction, multiplication, division, and finding the zeroes of a polynomial. The second menu is a collection of calculus-related functions: derivative, integral, finding local minima and maxima, and finding points of inflection.

Once you have selected your option, you will then proceed to Entry mode. Here, you will be prompted for some data. In most cases, you will only be asked to provide the polynomial, or polynomials, if more than one is required. However, for finding the zeroes of a polynomial, finding the minima and maxima, and finding the points of inflection, you will also be prompted for a minimum and maximum value. The minimum value is the initial guess for the function, and the maximum value is the value at which we should stop looking for a solution.

Once you input the data, there will be a slight delay while the calculator launches the algorithms needed to produce the answer, and then, your answer will be shown on the screen. For cases in which the answer is a polynomial, the answer will be converted back into a polynomial. In all other cases, an array of values will be shown, along with a text string indicating what they are.

Version History

- Version 1.1 – minor bug fix... multiple terms of the same exponent now work properly
- Version 1.0 – first official release
- Version 1.0b1 – program released, debugged by Anthony Cagliano and Kevin Rhodes

Known Bugs

This program is not intended for use with polynomials where the exponent is a fraction. This will almost certainly cause all sorts of weird errors.

Technical Information

Program Size: 4,556 bytes

Variables Used

Lists: PTE1, PTE2, F, R, A, B, TEMP, TEMP2, L1

Strings: Str0, Str1, Str2, Str9

Variables Destroyed

Lists: PTE1, PTE2, F, A, B, TEMP, TEMP2, L1

Strings: Str0, Str1, Str2

Algorithms:

Polynomial Addition: Addition of arrays

Polynomial Subtraction: Subtraction of arrays

Polynomial Multiplication: Looped array multiplication

Polynomial Division: Modified synthetic division

Zeroes of a Function: Sign-change algorithm; Built in TI 'solve' function

Derivative: chain rule

Integral: reverse-chain rule

Local Minima/Maxima: derivative once, zeroes of a function algorithm

Points of Inflection: derivative twice, zeroes of a function algorithm

** In addition, the algorithms for converting the input string into a list, and then the list back into a string have been totally revised, optimized, and streamlined.

Credits

A thanks to Kevin Rhodes, for a heck of a lot of assistance on the algorithms for converting strings into lists and lists into strings.

A thanks to my awesome girlfriend, for actually being the reason I found the bug in the PAU, and was inspired to even do this.

Thanks to Deep Thought, Juju, and Xeda, my fellow administrators on ClrHome Productions, where this project is hosted.

(<http://clrhome.org>). Questions or comments about this program may be directed to me on that site.

Legal Notices

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as a copy of this documentation is also provided, either textually or electronically.

By installing and using this software, you agree to release and save harmless ClrHome Productions from all liability resulting from misuse or abuse of this program. As a TI Basic program, there is virtually no risk to your calculator's hardware or higher-level programming from this program at all.

In addition, you agree not to modify the original source code of this program without first attaining the express permission of the author. This is because alterations to the program that I do not know about make it difficult for me to troubleshoot. If you do choose to modify your copy, I ask that you do not distribute it. This is also because it creates issues for me troubleshooting the program if there are various modifications being distributed as well.