User Manual for Polynomial Calculator

Adrian-Ioan Tuns

Departament of Computer Science
Faculty of Mathematics and Informatics
West University of Timișoara
Email: adrian.tuns99@e-uvt.ro

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Contents

1 Introduction

1.1 Purpose

The scope of this document is to explain and to illustrate how to properly use the Polynomial Calculator application. The User Manual is addressed to the end users that will use this application.

1.2 How to use this document

The first(1) section of this documents presents its purpose, its intended readership and also what is needed to use the application. The second(2) section provides a broad description of the application, as well as an assumption regarding the required level of expertise. The third(3) section present the instructions for actual use of the application. Initially it presents the Graphical User Interface and briefly explains its layout. The 3.1 section presents the special features of the calculator, followed by 3.2 section which explains each operation that can be made using the application, along with the known problems. In 3.3 section are given several examples of how the application work.

1.3 System Requirements

The following are the minimum system requirements for using the application:
Operating System: Any Operating System that support Java 8
RAM: 516 MB
Processor: Intel® Pentium® III Processor 1.00 GHz
Free Disk Space: 3 MB

1.3.1 Software Needed

This application requires additional software for usage: Java Runtime Environment(JRE).

This additional software can be downloaded from the following link:
`https://www.oracle.com/technetwork/java/javase/downloads/jre8-downloads-2133155.html`

2 Overview

The Polynomial Calculator is an application that can be used for doing the following computations on polynomials of integer coefficients, with one variable: addition, difference, multiplication, division, differentiation and integration.

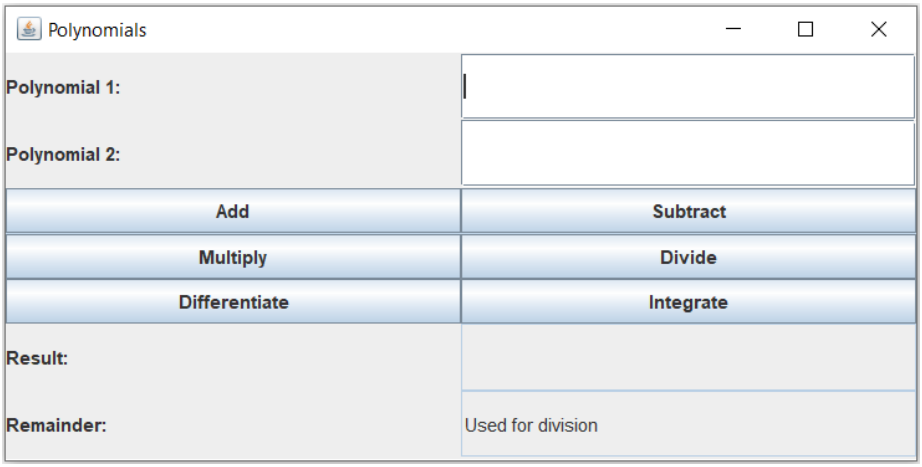
The application takes the input given from the keyboard and then shows the result in the text field labeled "Result".

The level of expertise required to use this software consists of knowing what is a polynomial and how computations work on it.

3 Usage instructions

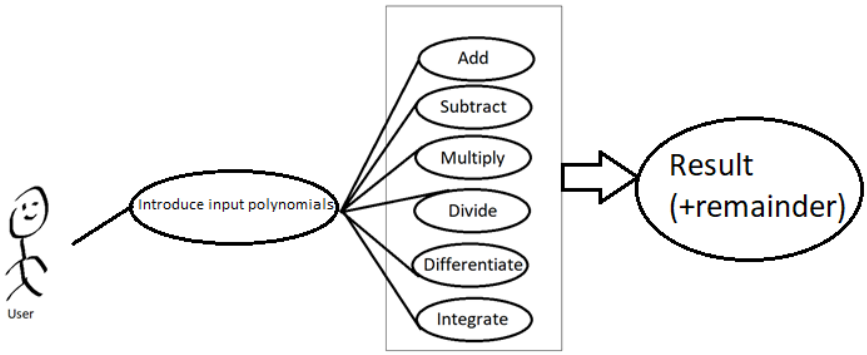
For a good functionality of the application, the user should be cautions to introduce a correct input(e.g. $5x^2 + 3x - 1$) and to be careful not to have negative-coefficient terms. However, those cases will be analyzed further in the following subsections.

The following image represents the Graphical User Interface of the application:



The interface is meant to be as intuitive as possible, as this is one really important aspect for a calculator-type application. It has two fields, "Polynomial 1" and "Polynomial 2" where the input is introduced. After the input was introduced, one of the six operations buttons is pressed and the result of the computations will be shown in the "Result" field. In the case of division, the remainder will be shown in the "Remainder" field.

A simple diagram showing how the user can interact with the application:



3.1 Features

Because everyone makes mistakes at times, especially when wanting to check the result for a mathematical equation, if one would accidentally press some other key while typing the input, the application will make use of the following feature: instead of giving an error, the calculator will search for the valid characters and ignore the rest. For example, if the input xˆabc+3# was introduced, the read polynomial would be $x+3$. However, the feature is not completely stable at the moment, because the application will not always give the correct result, as the foreign characters could make the application ignore some of the actual valid characters.

3.2 Operations

1. Addition

   The "Add" button sums the polynomials from the fields "Polynomial 1" and "Polynomial 2" and prints the result in the "Result" field.

2. Difference

   The "Subtract" button calculates the difference between the polynomials from the fields "Polynomial 1" and "Polynomial 2" and prints the result in the "Result" field.

3. Multiplication

   The "Multiply" button calculates the product between the polynomials from the fields "Polynomial 1" and "Polynomial 2" and prints the result in the "Result" field.

4. Division

   The "Divide" button calculates the long division between the polynomials from the fields "Polynomial 1" and "Polynomial 2". The quotient is stored in the "Result" field and the remainder can be seen in the "Remainder" field, which is only relevant after pressing the "Division" button.

   In the case of division by 0, an error message will be displayed.

5. Differentiation

   The "Differentiate" button calculates the derivative of the polynomial in the field "Polynomial 1" and prints the result in the "Result" field. The "Polynomial 2" field is ignored.

6. Integration

   The "Integrate" button calculates the primitive of the polynomial in the field "Polynomial 1" and prints the result in the "Result" field. The "Polynomial 2" field is ignored.

3.2.1 Known Issues

In the case of integration, if the given polynomial would have a negative exponent of "-1"(e.g. x^{-1}), the result would be wrong, the specific term being considered 0. The result for the term in this specific case should be a logarithm, but logarithms are outside the scope of this calculator application.

3.3 Usage examples

3.3.1 Tabular examples

- Introduce one or two polynomials as specified in the input fields (first two fields).
- Press the button representing the operation you desire.
- Read the result from the output fields (last two fields).

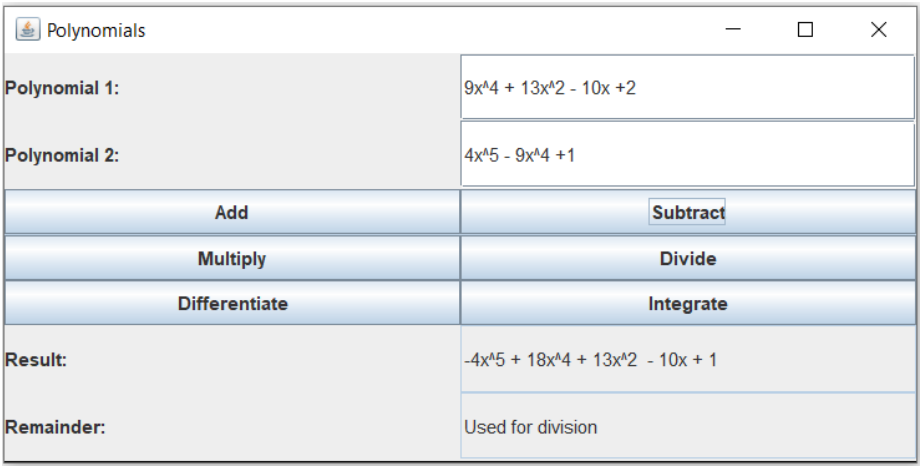
Polynomial 1	xˆ2+6x+9
Polynomial 2	4xˆ3-3xˆ2-x+2
Operation(button pressed)	Subtract
Result	-4xˆ3+4xˆ2+7x+7
Remainder	[irrelevant]

Polynomial 1	xˆ3-12xˆ2-42
Polynomial 2	xˆ2-2x+1
Operation(button pressed)	Divide
Result	x-10.0
Remainder	-21.0x-32.0

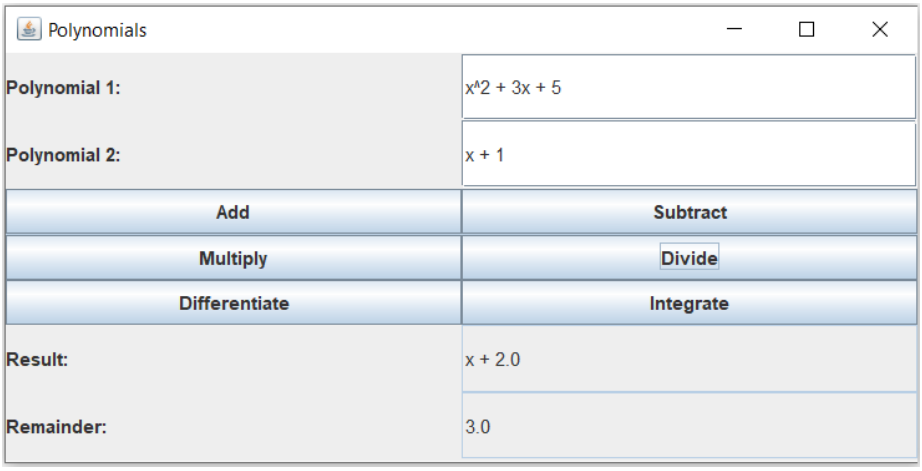
Polynomial 1	-10xˆ4+3xˆ2+3x-11
Polynomial 2	[irrelevant]
Operation(button pressed)	Differentiate
Result	-40xˆ3+6x+3
Remainder	[irrelevant]

3.3.2 Graphical Examples

Example of difference:



Example of division:



Example of addition using the unconventional data input, discussed in section 3.1: