

# PostFix Calculator

## User Manual

Version 2.0

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# 1. General Information

This section of the document deals with the details of how the system works and goes through the layout of this document.

## 1.1 Introduction

The purpose of this document is to make the user familiar with the system environment and show the functionality of the software. The use of examples and visual aids will help orient the user with the system. This document also covers how to get started, install and troubleshoot need be.

## 1.2 System Overview

PostFix Calculator is an application that executes calculations input by the user in postfix notation. This includes unary, binary and more types of operations. The application allows input of and operations on the constant  $\pi$ . Decimal numbers are also supported.

## 1.3 Postfix Notation

This calculator works in Postfix Notation (or Reverse Polish Notation) which is a system of notation where the operations are entered after the operands. This eliminates the use of parentheses and thus makes operations simpler.

For example, the regular expression for adding 2 and 4 would be "2 + 4" which we use in our day to day lives, as opposed to the postfix expression "2, 4 +".

PostFix Calculator accepts input in postfix notation only, hence it is advised that the user provides input in postfix notation. Several input/output examples are provided in the following sections of the document.

## 1.4 User Characteristics

The user for this software is any individual looking to calculate arithmetic functions in postfix or plot graphs. This software is developed for mobile devices but deployed on PC with JVM and can be accessed through Eclipse or launching it through terminal.

# 2. Getting Started

This section of the document is a tutorial that walks the user through the installation of the system.

## 2.1 System Requirements

Before the user gets the software, it is highly recommended that they check for the following things.

- The user is downloading the software on a Personal Computer (PC) and not a mobile device. It is highly recommended to use a PC operating on Microsoft Windows. Other operating systems might not work properly.
- The PC has a Java Virtual Machine installed on the computer and is capable of running JVM applications.
- The user is connected to the internet. This is crucial to download the software.

## 2.2 Download

In order to download a copy of the software, visit the project website [here](http://vladimir95.github.io/), or type in your browser "<http://vladimir95.github.io/>", and click on the link "Postfix Calculator".

Doing so shall initiate a download. You have to do this step only once.

## 2.3 Launch

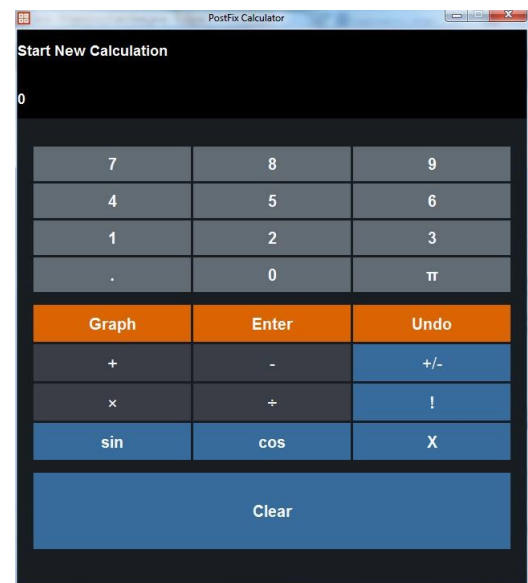
Go to your downloads folder and launch the downloaded file. This will launch the Postfix Calculator. The system is now ready for use.

## 2.4 User Interface

The Postfix Calculator has a very simple user interface. Upon launching the downloaded .jar file, the Calculator view pops up. The user is now ready to interact with the system. Upon launching the system, an interface, such as the one on the right, pops up.

Almost immediately, the striking colour scheme catches the eye. This very strategically chosen colour scheme differentiates the functions from one another and categorizing them into number keys(light grey), unary operators(blue), binary operators(dark grey) and special functions (orange).

At the top of the page there are text fields that display the output of the calculator and input from the user.



## 3. Using the System

This section walks through the functionality of the program and gets the user acquainted with the functions and operations.

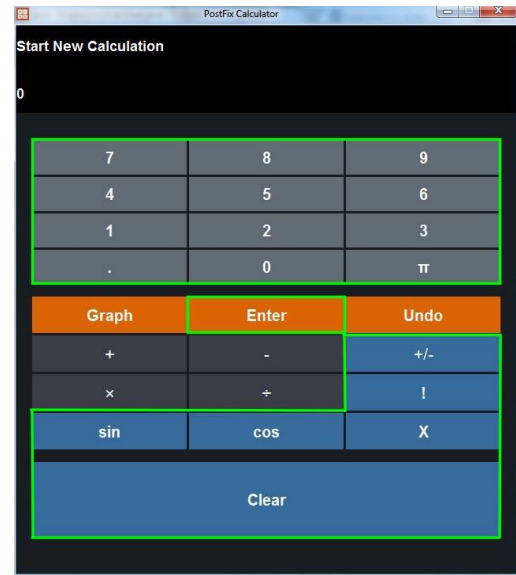
### 3.1 Unary operations

This section explores the blue buttons in the calculator. These are very basic functions and a great place to start. For this section, we shall only be using the buttons outlined by green.

These are called unary operations because they require only one operand for the function to work.

The Enter button is a very crucial part in the operation of the calculator. After every value that is typed, it needs to be “pushed” into the stack so that it can be calculated.

Therefore, after every numerical value, you press enter to push it in the stack. Let us try a few examples to get the hang of it.



Feature	Expression	Output
Sine Function	0, sin	$\sin(0) = 0$
Cosine Function	$\pi$ , cos	$\cos(\pi) = -1$
Factorial Function	7, !	$7! = 5040$
Change Sign	6, + / -	-6
X	We shall skip this for now!	
Clear	Clear	Clears the entire field and you may now start a new calculation

Try the following examples and you should get the same result as mentioned.

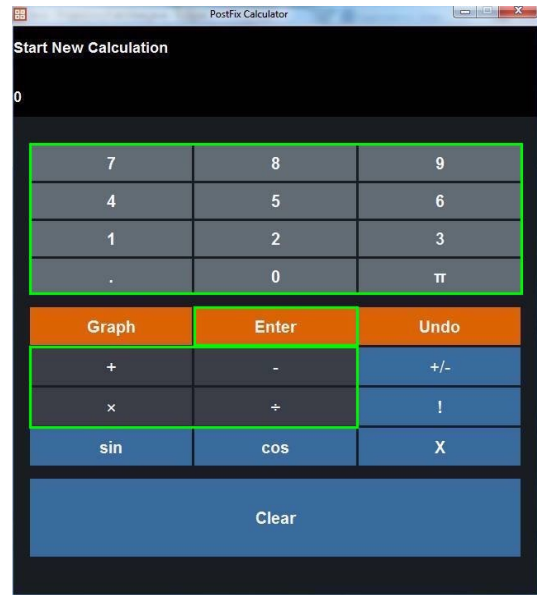
Keep in mind, every time a comma is written, it marks the end of the numerical value and it needs to be pushed in the stack. Therefore we press 'Enter' wherever we see a comma. After every calculation, we press 'Clear' in order to clear up the previous calculation and clear up the calculator for a new calculation.

## 3.2 Binary Operations

This section explores the features of binary operations. This refers to the dark brown section of buttons. These are called binary operations because these functions require 2 operands.

In this section, the buttons are outlined in green. We shall be using the numeric pad and the 'Enter' key which we are already familiar with.

We previously learned that this is a reverse polish notation calculator. That means we need to provide the operands before we operate on them. This means if you need to perform the function  $A + B = C$ , we shall first push A into the stack, followed by B and then we operate on them by pressing +. This following sequence will result in C.



Try the following arithmetic binary operations.

Feature	Expression	Output
Addition	5, 5, +	$5 + 5 = 10$
Subtraction	9, 4, -	$9 - 4 = 5$
Multiplication	5, 6, x	$5 \times 6 = 30$
Division	14, 7, ÷	$14 \div 7 = 2$

### 3.2.1 Compound Operations

Before we get into compound operations, we equip ourselves with the knowledge of 'Undo'. While the user is typing in a number and 'Undo' is pressed, it takes back the last digit or decimal point pressed until doing so would clear the value entirely. If so, it should show the result of running the current expression in the expression list. If user is not typing and 'Undo' is pressed, it removes the top item from the history list and update the display. Since compound operations include many more operands, 'Undo' might come in handy to fix any mistakes.

Compound expressions are simply expressions that consist of multiple arguments being operated upon by unary and binary operators in a distinct order. The

calculator supports all compound expressions possible with the supported operators.

As an example, let us calculate the value of  $((\cos(\pi)+10)\times 10)$ . Note that this must be input in postfix notation. To do so, the user must perform the following actions:

- Input the constant  $\pi$  located at the bottom of the numeric pad by pressing it's button.
- Press the cosine operator button ( $\cos$ ) located in the operator panel.
- Enter 10 on the numeric pad and press enter.
- Press the "+" operator button.
- Enter 10 on the numeric pad and press enter.
- Press the "x" operator button to receive the output.

The expected output is 90.

### 3.3 Graphs

This section of the manual explores the graphing feature in the calculator. In this section we acquaint ourselves with the 'Graph' and 'X' button specifically. 'X' acts as variable in expressions. Since it is limited to only graphing and the calculator does not support arithmetic operations with the variable 'X', any arithmetic operation returns the result 0.

Outlined in green, we see the 'X' and the 'Graph' buttons. We can use any other button on the view. When the 'Graph' button is pressed, the expression in the top of the stack is plotted in a new view with a grid.

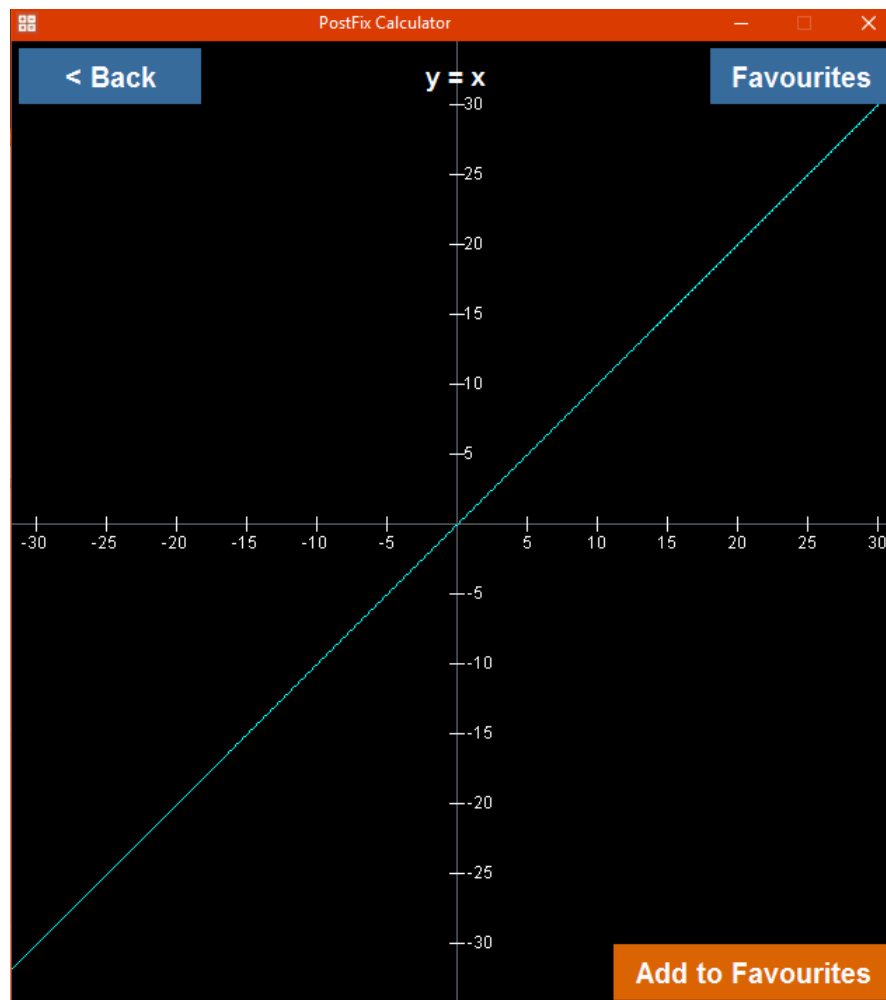
The user can toggle from the graph view to the calculator view with great ease. Pushing the back button located at the top left corner of the graph view loads the Calculator view.



Try plotting the following functions and compare them with the given graphs provided on the following page:

- $y = x$
- $y = \cos(x)$
- $y = -5$

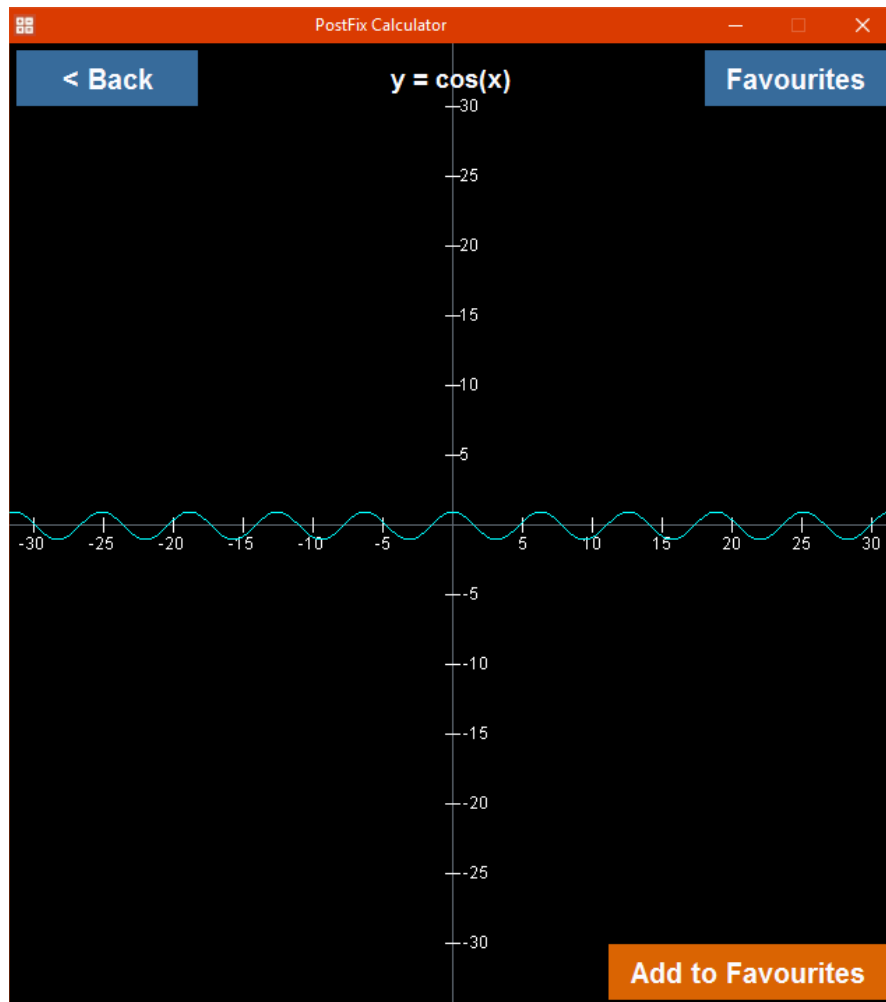
This is the graph of  $y = x$



Once you have the same graph as above, click on 'Add to Favourites' and you should see the Favourites view and you will see  $y = x$  listed there. Now, go back to the Calculator view and graph the next function.

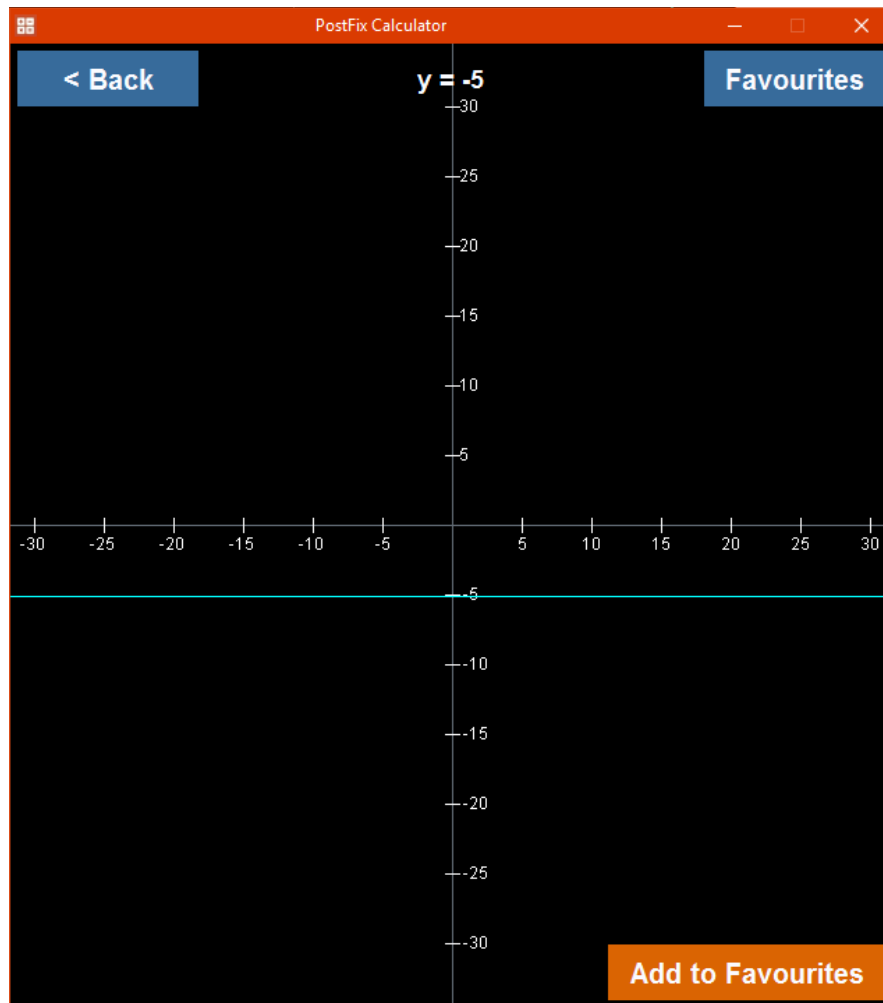


This is the graph of  $y = \cos(x)$



Repeat the steps from the previous graph to add this graph to the favourites. Similar to above, go back to the Calculator view and plot the last function.

This is the graph of  $y = -5$



This covers plotting the basic functions, you can use your knowledge to plot many complex functions.

Now, we shall discuss the Favourites function and learn how to manage our favourite plots.

### 3.3.1 Favourites

Favourites is a function that allows the user to store up to 15 functions and have them readily available to plot.

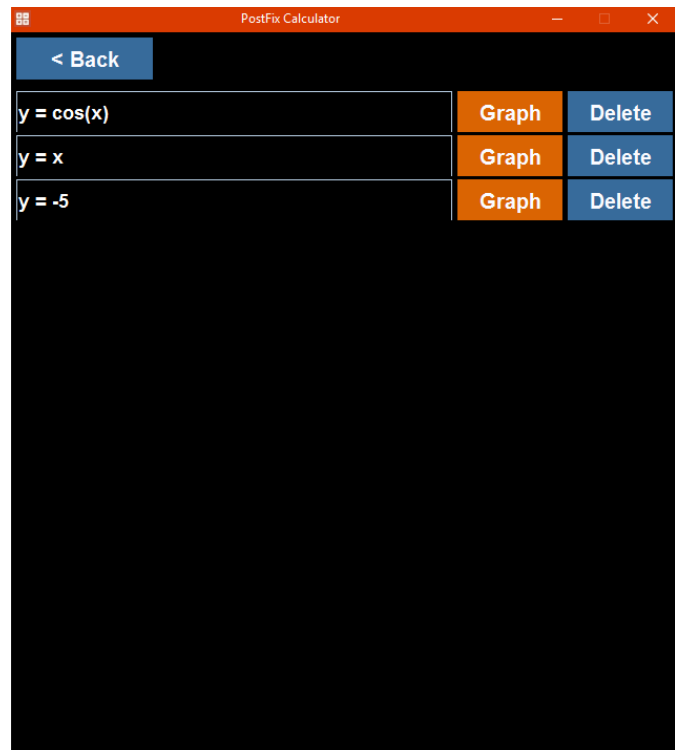
As seen in the figure below, in the Favourites view the user has the option to graph the favourites, by clicking 'Graph' or delete them by clicking 'Delete' right at a the favourites view. The user can toggle back to the graph view by the simple click of 'Back' button, located at the top left corner of the view, just like in Graph view.

Now, try adding the graphs from the previous activity as your favourites and deleting them.

Simple steps to do so are listed below:

- Plot a function using the 'Graph' button.
- Now that the graph is plotted, click on the 'Add to Favourites' button.
- In the favourite view, it can be seen that the plotted function appears in the favourites.
- Repeat this process for a few more functions of your choice.
- Now, to delete the favourites, click on the 'Favourites' button
- In favourite view, click on 'Delete' next to the functions you wish to remove.

You have now successfully, removed the functions from favourites. This completes your tutorial and now you are equipped with the knowledge to use Postfix Calculator.



## 4. Exiting the Application

In order to exit the application, the user can simply just press the close button, and the application exit.

## 5. Troubleshooting

In an unlikely event of the system not responding, or freezing follow these steps:

- Press Clear  
This would reset the calculator and start a new calculation and continue to use the calculator.  
If this step does not work, move on the next one.
- Press the exit button, the red button in the top right/left corner based on your operating system. This should exit the application and restart it and continue using. If the step does not work, move on to the next step.
- In a case that the application does not respond at all, wait for a while and if there is no improvement force quit the application and then relaunch it.
- Report the problem to us, so that we can make your experience better and fix this issue.