JSciCalc

This is a scientific calculator cum graph software developed completely in Java.

Features:

1. Trigonometric functions (sin (), cos (), tan (), arcsin (), arccos (), arctan()).
2. Logarithms (base 10 and base e).
3. Factorial function.
4. Exponential functions.
5. Square roots and cube roots of rational numbers.
6. Modes to enter angles in radians as well as in degrees.
7. Functionality to draw the graph of expressions(like y=x*sin(x), x=y^2, x=cos(t), y=sin(t)).
8. Supports operator precedence, so complete expressions can be entered at a time.
9. Evaluates inverse and determinant of Matrices.
10. Solves set of simultaneous linear equations.
11. Supports real time help, the function of the component on which the mouse is pointing is displayed in a box.
12. Modern look and feel of the Graphical User Interface (GUI), developed in SWING, and is independent of the appearance of the operating system.
13. Portable across different platforms.

Screenshots:

○ Radians ● Degrees			Input display			
sinh	cosh	tanh				
sin	cos	tan	arcsin	arccos	arctan	AC
e^n	10^n	ln	log	(	)	DEL
7	8	9	/	n!	cube	ANS
4	5	6	*	^	sqre	CM
1	2	3	-	e	cbrt	RM
0	.	=	+	pi	sqrt	M

This is the screenshot of the main scientific calculator. There are various buttons for the numbers and the functions. Additional features like Graph, Matrix Operations are provided under the Extras Menu. Help is available under Help Menu. The uppermost display box is the input display, the one beneath it is the output display, and the smaller one beneath it displays the function of the component on which the mouse pointer is currently pointing.
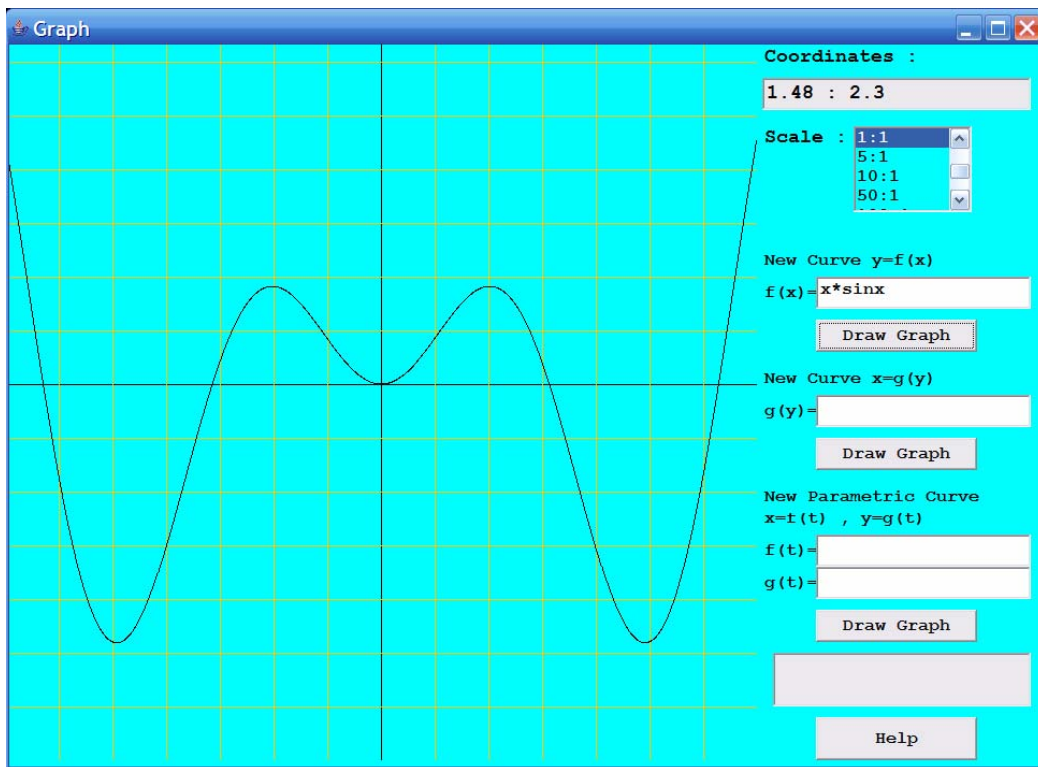
This is the screenshot of the graph window, which is activated on clicking the "Graph" menu item under Extras menu in the calculator. This is the graph of x*sin(x). The required function is entered in the corresponding text box, and on clicking the Draw Graph button, the graph is drawn. 3 types of graphs can be drawn. The coordinates tab displays the coordinates of the point where the mouse pointer is pointing with respect to the scale of the graph. If Scale is 1:1, each square box represents 1 square unit. Similarly if scale is 5:1, each square box represents 25 square units, with each side 5 units. The scale can be changed by choosing a particular scale in the "Scale" list. The default scale is 1:1. The minimum scale is 0.01:1, and the highest is 1000:1. Closing the graph window does not close the calculator window. So it is advisable to close the graph window when not required.

Operating Instructions for JSciCalc:

1. The minimum screen resolution for viewing the complete calculator and graph program is 1024x768. With a lower resolution, the complete program cant be viewed.

2. Buttons are provided for all the numbers and functions. Clicking on the button with the mouse displays the respective number or function in the input display box, and adds it to the input expression. Operator precedence is supported, so the complete expression can be entered at once. To evaluate the expression, press the = button, and the result is displayed in the output display box.

3. The number representation in the output display is in terms of integers, but for very large and small numbers, the exponential format is used to be able to display a larger range of numbers. Eg. 4.5425E32 represents 4.5425 multiplied by 10 raised to the power 32. Same goes for negative exponents.

4. Operator precedence is as follows in increasing order-

- Addition (+), Subtraction (-)

- Multiplication (*), Division (/)

- To the power (^) , sqre, sqrt, cbrt, cube

- sin(), cos(), tan(), arcsin(), arcos(), arctan(), sinh(), cosh(), tanh()

- Factorial (!)

- Parentheses ( )

eg. 1+2*3 gives the result 7. 1*2+3 gives the result 5.

5. **To use the functions provided, press the corresponding function button, and then the number. eg. To calculate the sin of 5 radians, press the sin button and then press 5, followed by =. Use brackets wherever applicable. However, excess brackets may also lead to unexpected results! So use only the required number of brackets.**

6. **To find negative exponents, use 0- the exponent. Eg. To find 12 raised to the power -5, write 12^(0-5). Unary – operator is not supported in all cases, so this is always the better option. To find the graph of e raised to the power –x, write e^(0-x).**

7. **For operation of many rational numbers simultaneously, it is advisable to split the expression if the number of operands is large, say around 15. Memory overflow might occur in that case. For integers, a far higher number of operands can be simultaneously operated upon.**

8. **The button AC clears both the displays simultaneously, whereas DEL button acts more like backspace, it deletes one digit in the input display at a time.**

9. **The output is displayed in the output diplay box, but if you want to use the result or the output in a further calculation, the button ANS has been provided, it clears the input display box and displays the answer in the input box itself.**

10. **The operator for multiplication is *, it should not be confused with the variable x.**

11. **There are 2 modes for entering the angles for trigonometric functions- Radians and Degrees. The default mode is radians, if you want to change it, the corresponding radio button can be clicked.**

12. **2 constants- e and pi have been provided. Whenever you want to use either of them, just click the corresponding button, and they can be used as many times as you want by clicking repeatedly.**

13. **For memory functions, 3 buttons M, RM, CM have been provided. M calculates the input expression and stores it in memory. No storage in memory takes place if there is no calculation involved. So if you want to store the number 6 in memory, write 6*1, then press = button, and press the M button to store it in memory. RM retrieves the number stored in memory and appends it to the input expression. CM clears the current memory. The memory gets wiped when the program is closed.**

14. **Under the menu labeled Extras, additional features like Graph, Determinant of a matrix, Inverse of a matrix, and Solution of simultaneous linear equations has been provided. Clicking on the Menu Items invokes the corresponding application in another external window. Close the external windows when not required.**

15. **3 different types of graphs can be drawn- y=f(x), x=f(y) and parametric curves of the type x=f(t),y=g(t). So 3 corresponding text boxes are provided to enter the functions, and clicking the Draw Graph button draws the graph on the grid area. Moving the mouse pointer on the grid area displays the coordinates of the current mouse position depending on the chosen scale. A different number of scales have been provided to provide varying levels of zoom, but all graphs cant be viewed equally well in all scales. The minimum scale is 0.01:1 and the maximum is 1000:1. To enter the function, use the keyboard. Trigonometric, exponential, logarithmic and other functions applicable in the Calculator are**

also applicable in the Graph. Operator precedence is followed as before. For y=f(x), x is the only variable that can be entered, everything else is a constant. For x=f(y), y is the only variable, and for x=f(t), y=g(t), t is the only variable. The function, variable names are all case sensitive, use only small letters. If insufficient data is provided, an error message is displayed in the lowest box. Equations involving both x and y are not supported. When not required, close the graph window.

16. To find the determinant of a matrix, click on the corresponding MenuItem under Extras Menu. Choose the degree of the matrix. Then enter the elements of the matrix. Only numbers can be entered, not functions and no element should be empty. After filling in all the boxes(elements of the matrix), click the Button Calculate, and the determinant of the matrix is displayed in the Result box. To return to main menu, click on Home button.

17. To find the Inverse of a matrix, click on the corresponding MenuItem under Extras Menu. Choose the degree of the matrix, then enter the elements of the matrix. Only numbers can be entered, and again, no element should be empty. After filling in all the boxes(elements of the matrix), click the Button Calculate, and the Inverse of the matrix is displayed under the Inverse of the Matrix label, element by element. To return to main menu, click on Home button.

18. To find the solutions of simultaneous linear equations, click on the corresponding MenuItem under Extras Menu. Choose the number of variables in the equations. Then enter the coefficients of the variables in the equations, and no element should be empty,

and only numbers can be entered. After entering the coefficients, click on the button Solve, and the solution to the system of equations is displayed. If the solution is displayed as NaN, which means that the system of equations has no solution.

19. Real time help has been provided, ie. when the mouse pointer is moved on the calculator screen, then the use or function of the component on which the mouse is pointing, is displayed in a box. By default, real-time help is turned ON. To turn it off, a Checkbox option in the Help menu is provided. By clicking on the option, Real-Time Help can be turned ON or OFF.

20. A Help window can be invoked by clicking on the Help menu item under Help menu.

21. On clicking on the menu item Exit under File menu, the program exits.