QUICK START TUTORIAL

CREATING A PROJECT STEP-BY-STEP

Welcome! We assume that you have successfully installed Pintar ***VirtuaLab***$_{TM}$ Mathematics on your computer. You are now ready to use this fantastic tool to explore the mysteries of mathematics.

For a novice user, the quickest way to become familiar with Pintar ***VirtuaLab***$_{TM}$ Mathematics is to follow this step-by-step tutorial. Throughout this tutorial, you will find quick references to the detail description, as indicated by the (?) symbol.

This tutorial also assumes that you possess a working knowledge of Windows 9x, NT, ME, 2000 or XP. Certain words used to describe operations in this tutorial have specific meaning.

Click	Press once on the mouse button.
Double-click	Press twice on the mouse button in quick succession.
Select	Click once on a specific object.
Drag	Press the mouse button and drag, holding the mouse button down as you do so. Let go to the mouse at the intended location.
Type	Press on a specific key on the keyboard.
Choose	Select a menu item.

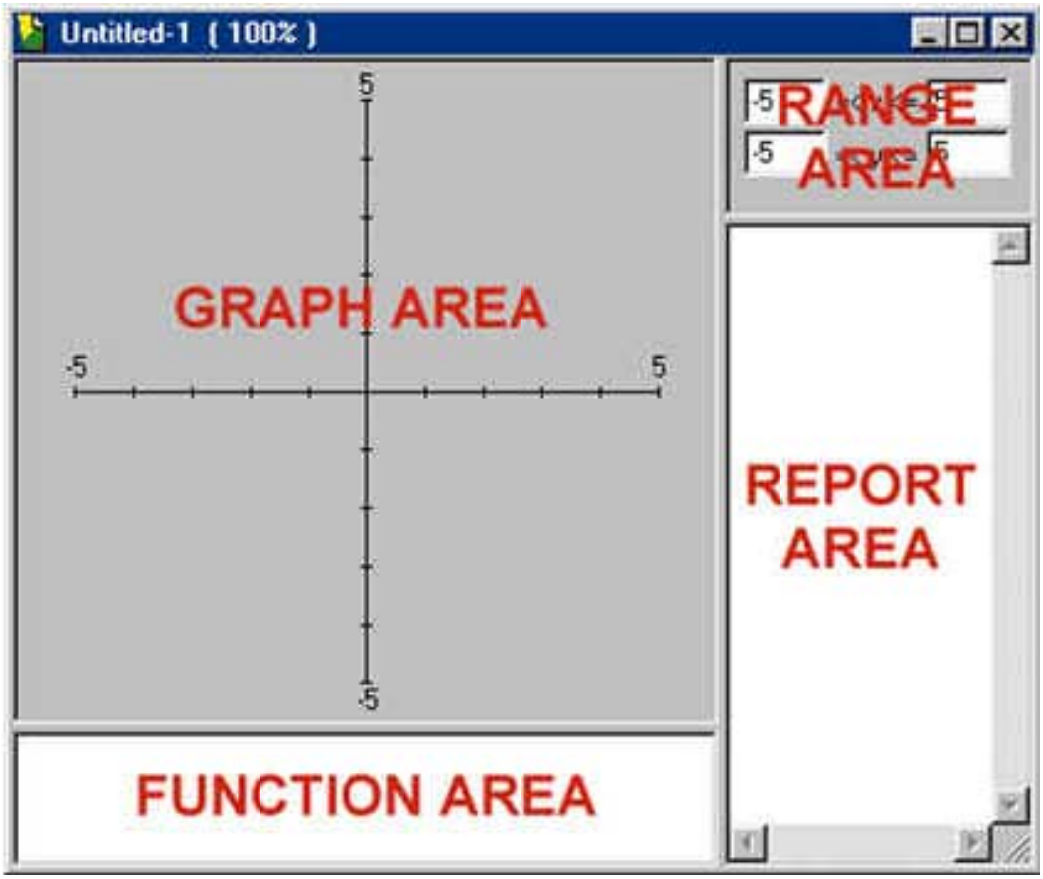
Launching Pintar VirtuaLab$_{TM}$ Mathematics

We assume that you have successfully installed the Pintar ***VirtuaLab***$_{TM}$ Mathematics. In the Mathematics folder, double-click on the icon labelled MATH.EXE.

TUTORIAL 1

1. Starting a new project.

a) Under the File menu and in the New sub-menu, choose the item Functions Analyzer. A blank Workbench named "Untitled-1" is created.



The Workbench is divided into four areas: Graph, Range, Function, and Report.

? • **Starting a new experiment**

? • **Coordinates Axes**

2. To draw a simple function on the Workbench

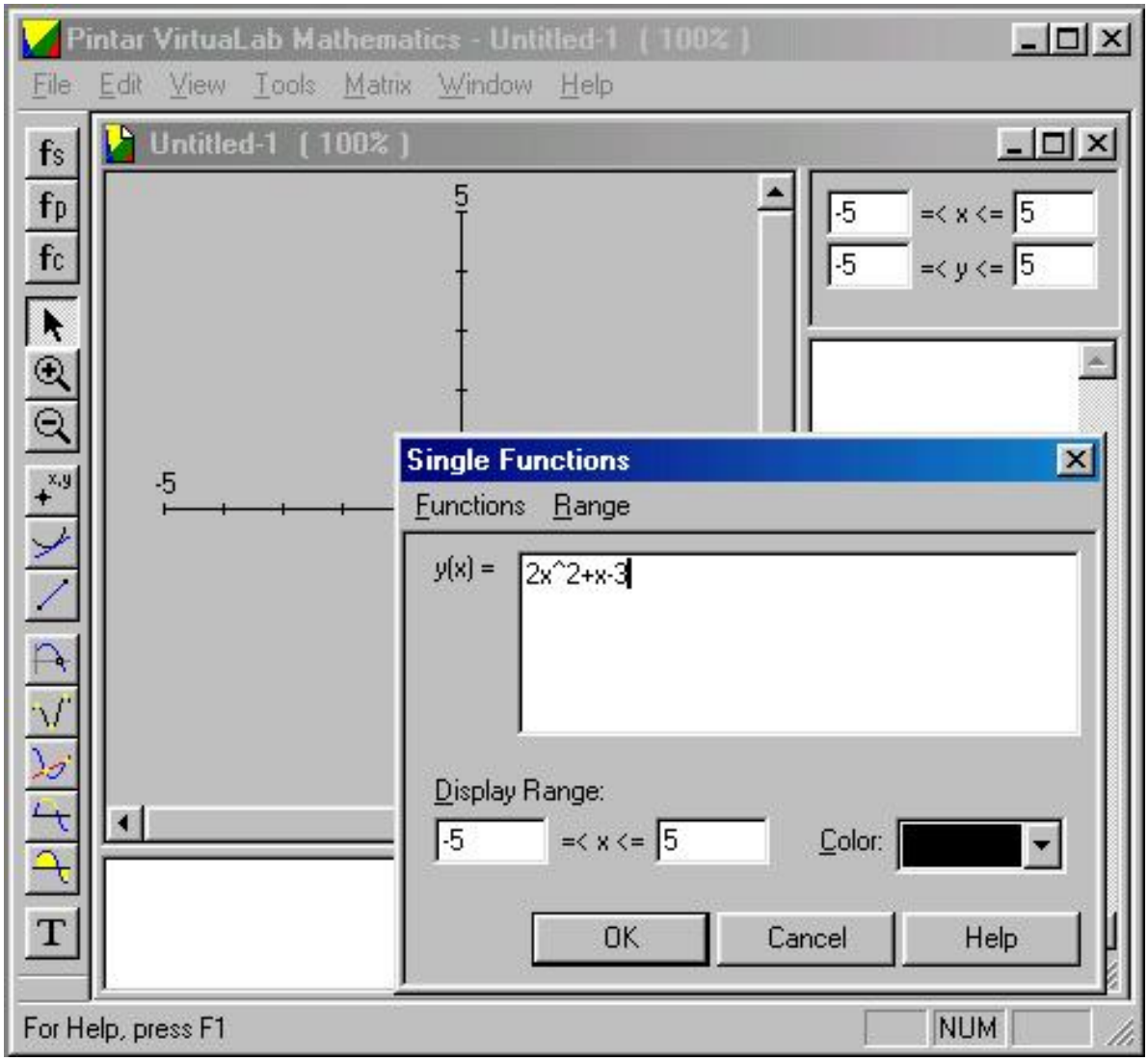
In the Tool bar, click on the Simple Functions icon <pic>. A Simple Function dialog appears.

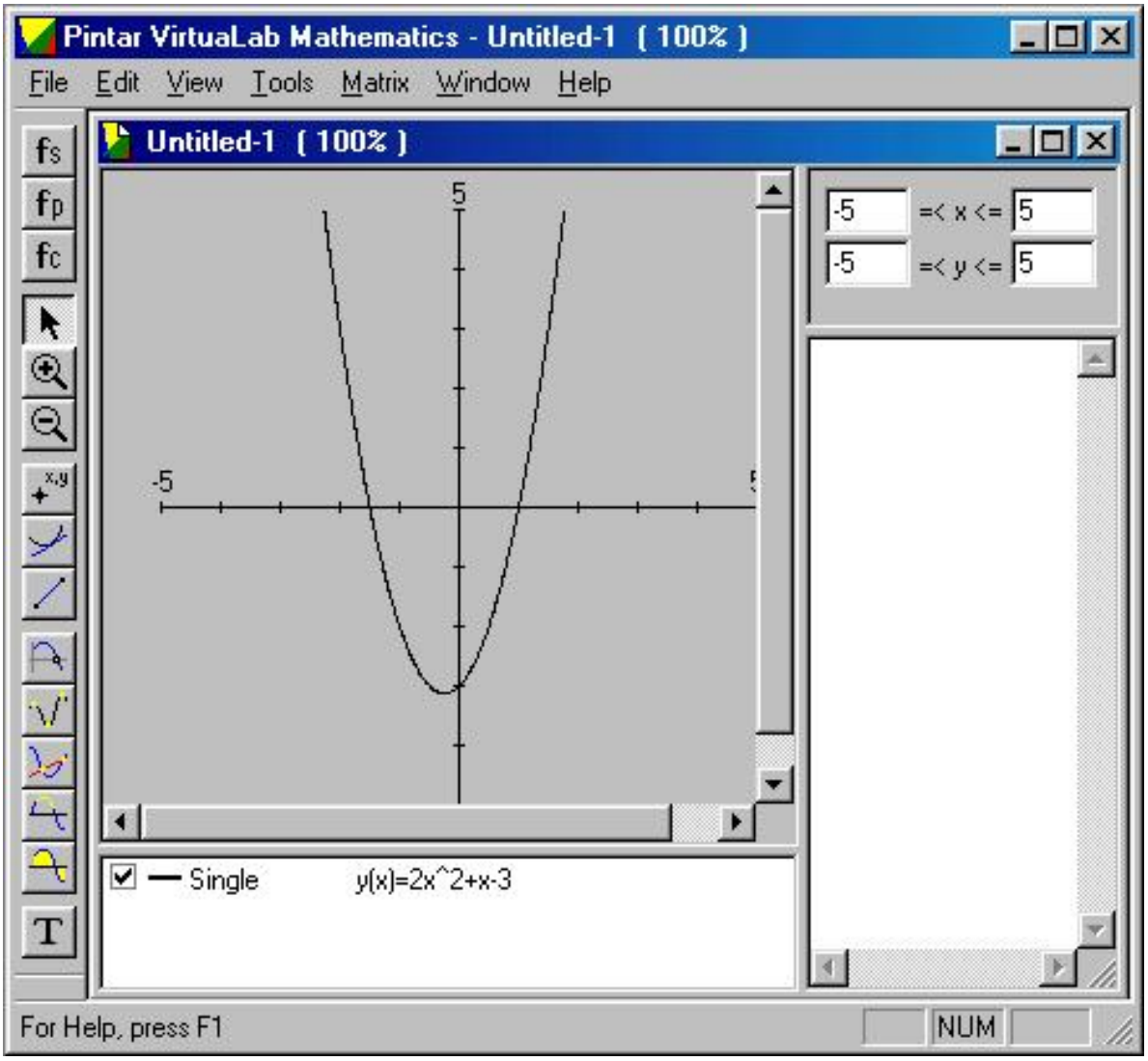
In the field following y(x)=, type in the expression, 2x^2+x–3. This is the form that you have to type in Pintar ***VirtuaLab***$_{TM}$ Mathematics, as opposed to the algebraic form, $2x^2 + x - 3$.

Note: The Display Range in the dialog refers to the limits within which a function is drawn. It is not the same as the limits indicated in the Range area. The limits in the Range area is for setting the length of the axes.

? • **Simple Function**

? • **Simple Function dialog box**

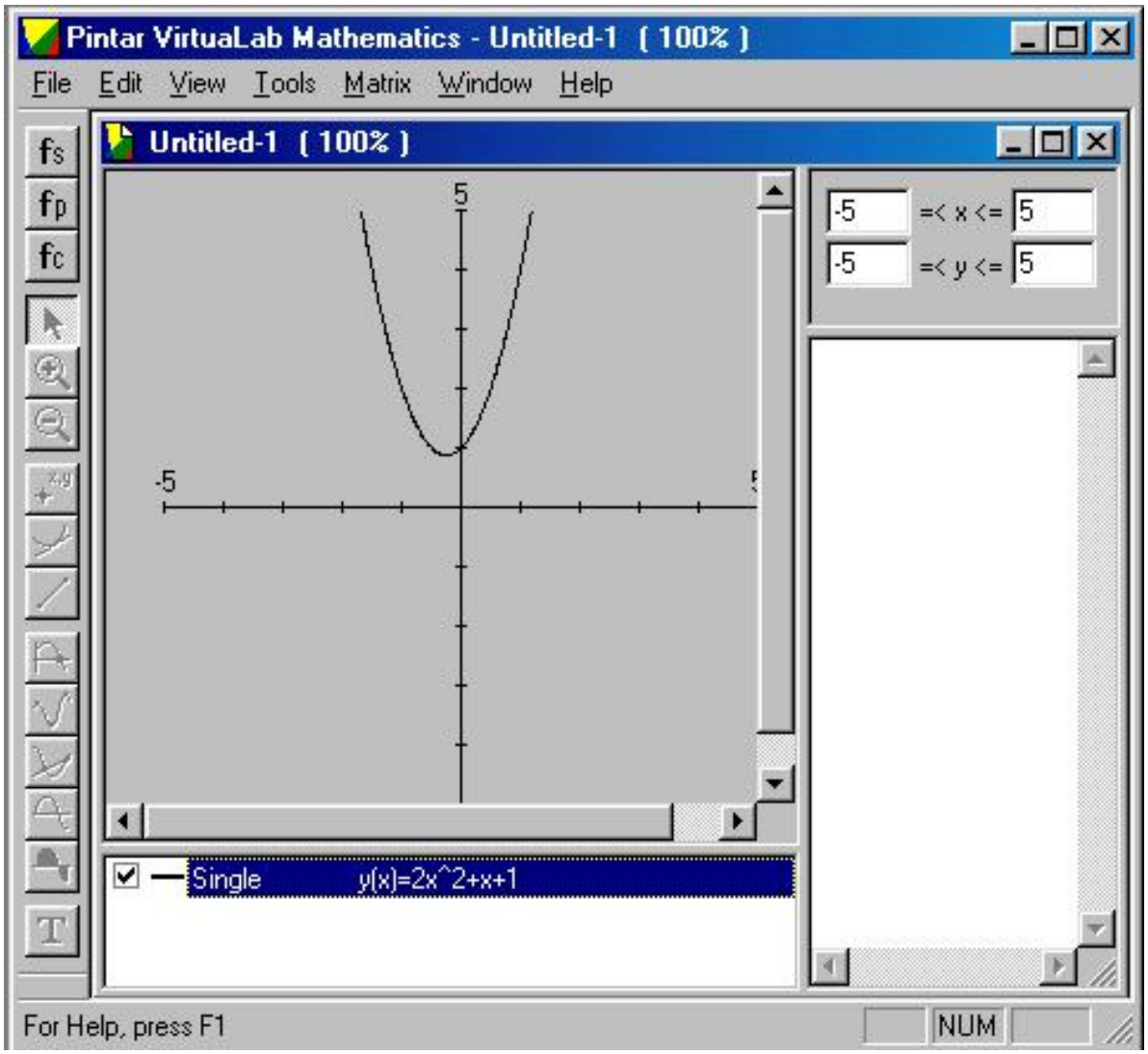

Pintar VirtualLab Mathematics - Untitled-1 (100%)
File Edit View Tools Matrix Window Help
Untitled-1 (100%)
5
-5
-5 =< x <= 5
-5 =< y <= 5
Single Functions
Functions Range
y(x) = 2x^2+x-3
Display Range:
-5 =< x <= 5
Color:
OK
Cancel
Help
For Help, press F1
NUM



3. To edit an expression

What we want to do next is to play around with the expression and see how changes in the variables and operators affect the shape of the function.

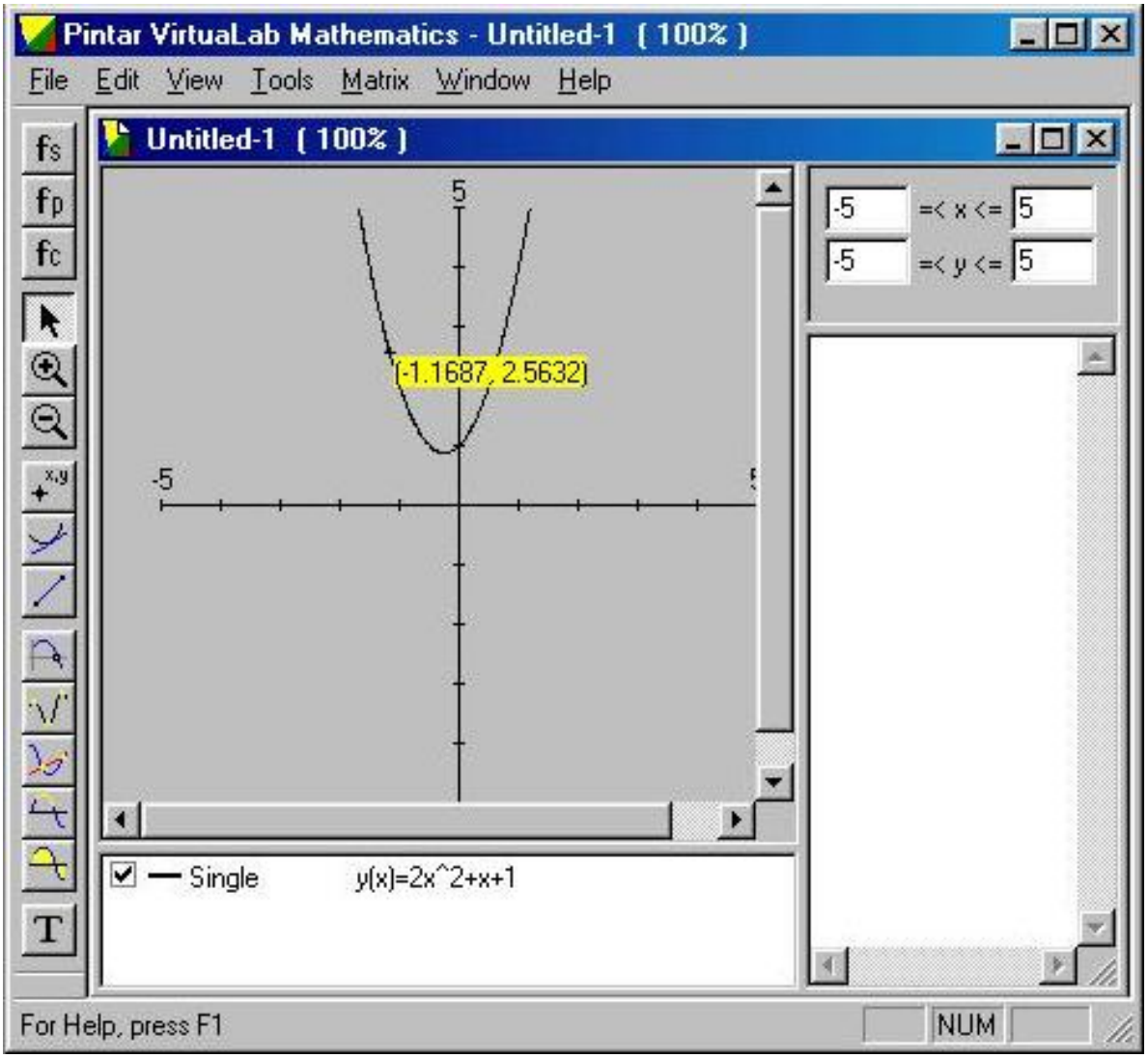
a. In the Function area of the Workbench, double-click on the expression. The Simple Function dialog appears.
b. Change the expression 2x^2+x–3 to 2x^2+x+1
c. Click OK. You will now see that the function in the Graph area has altered.



4. To determine the coordinates of a point on the function

a. Select the Coordinate tool  in the Tool bar. The cursor changes to a cross-hair.
b. Click on or very near a discrete data point of a function, the coordinate point is attached to this function. The coordinates are displayed as (x, y) next to the point.

? • **Coordinates**



5. To move or place a coordinate point to a precise location
A coordinate point on a function can be placed with great accuracy anywhere along the function.

a. Double-click on the coordinate point. The Coordinates properties dialog appears.
b. Enter the desired values in the respective parameter boxes.
c. Click OK.

Note: A coordinate point can be moved along a function using the arrow keys. This method is less accurate than the method described above.

a. Select the coordinate point you just drew. Its coordinates highlighted in yellow.
b. Type on an arrow key. The coordinate point will move by one pixel in the direction of the arrow key typed.

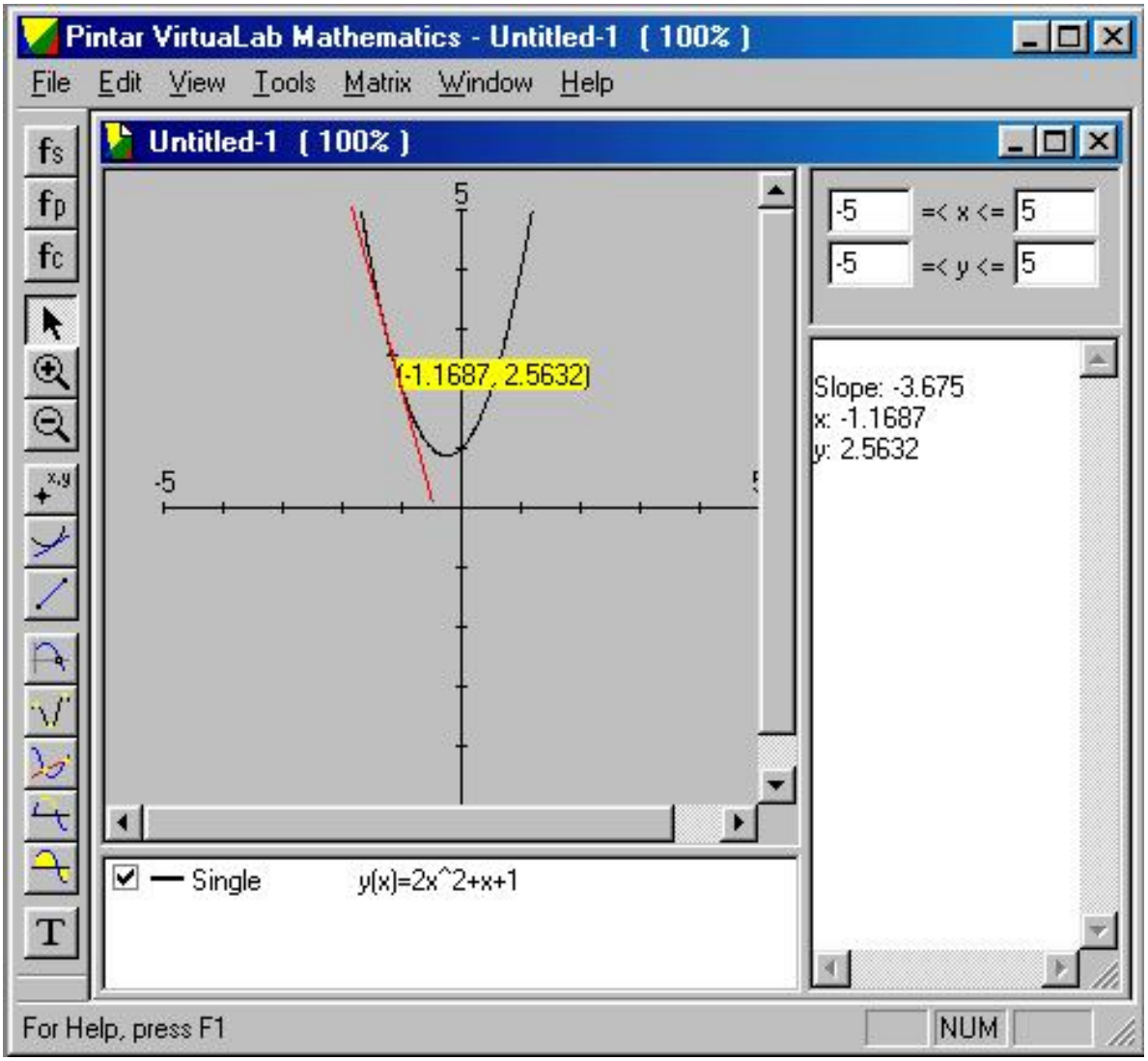
? • **To move a coordinate point**

6. To draw a tangent at a point on a function

Having moved the coordinate point to the desired location, we now want to find the gradient of the function at that point.

a. Select the coordinate point in Step 5 above. The coordinates highlight in yellow.
b. Select the Tangent tool. The cursor changes to a cross-hair.
c. Click on the coordinate point. A tangent is drawn instantly at the point. The slope of the tangent is shown in the Report window.

? • **Tangent**



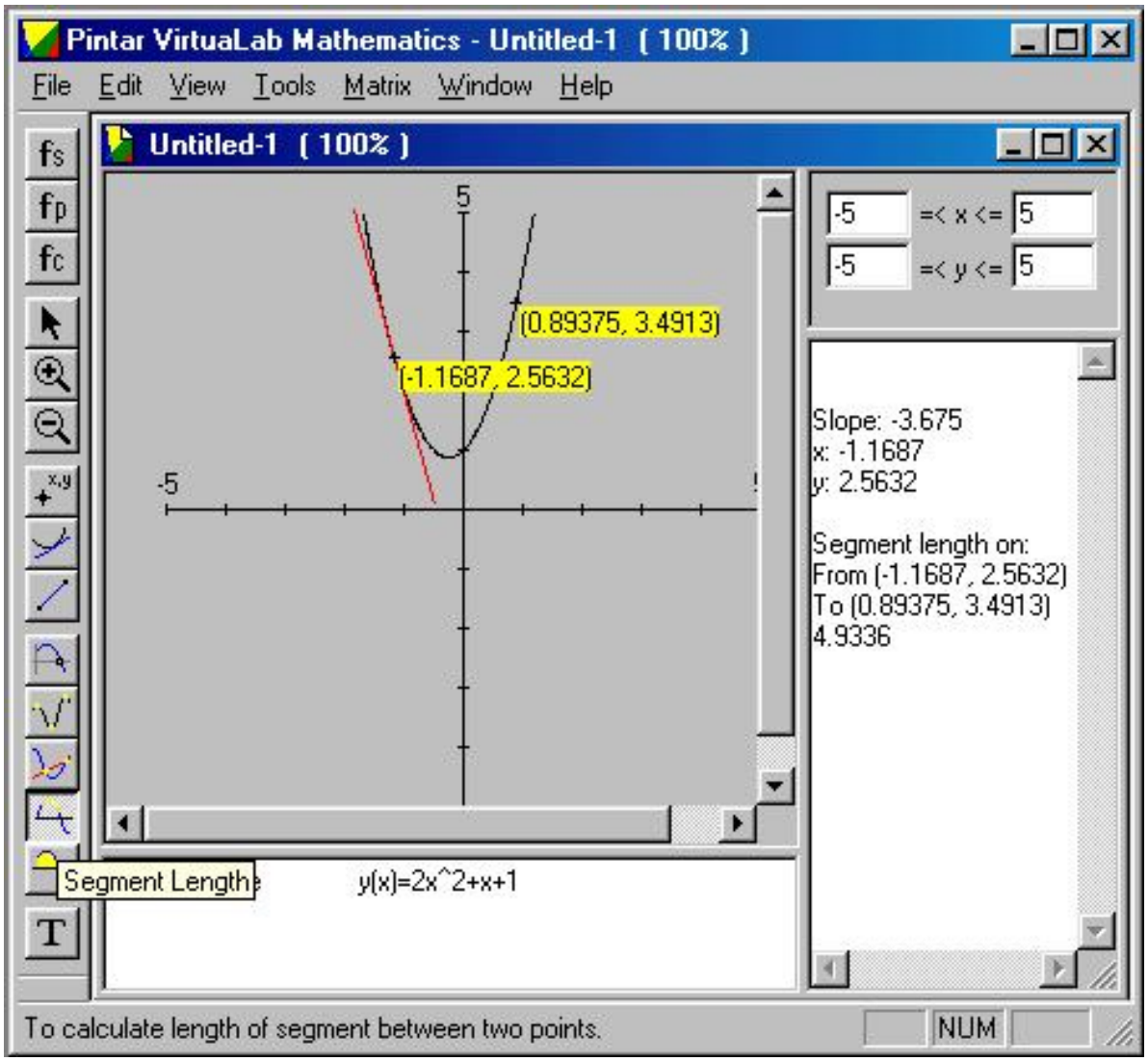
7. To measure the length of the curved segment between two coordinate points

We already have one coordinate point. We need to create another for this exercise. Therefore, repeat Steps 4 and 5 to create the second point. Then,

a. Select the Segment Length tool  .
b. Click on the first coordinate point to indicate the starting position of the segment. The coordinate point highlights in yellow.
c. Then, click at the other coordinate point to indicate the end of the segment. The segment and the second coordinate point highlight in yellow. The coordinates of the two ends and the length of the segment is displayed in the Report window.

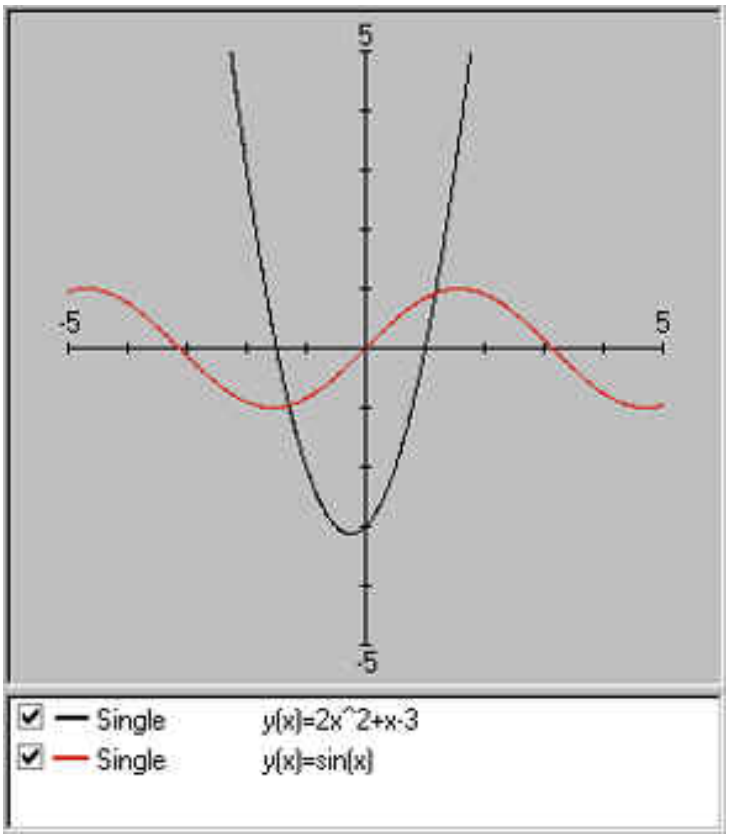
Note: The length of the segment will not be accurate if all discrete data points of the segment do not have finite coordinates.

? • **Segment Length**



8. To add another function on the Workbench.
Having so much fun with just one function, we want to raise the stakes by adding a second function to our exploration.

a. Just as in Step 2, click on the Simple Function icon in the Tool bar. The Simple Function dialog appears.
b. This time, instead of typing in the expression, open the Functions menu in the dialog.
c. In the Trigonometric sub-menu, choose Sin(x). The expression is written into the editing field. The space between the parentheses is selected and highlighted.
d. Type 'x' into the selected space.
e. Click OK. The Graph and Function areas will look like:



You can selectively show or hide a function by checking or un-checking the checkbox in front of their respective expressions in the Function area.

9. To find the points where the two functions intersect

a. Select the Intersection tool  .
b. Click near the point of intersection. The point of intersection will be computed, and its value will be displayed in the Report window.
c. Do the same for the other intersection point.

? • **Intersection**

10. To determine the distance and slope of a line joining two points
In order to determine the distance and slope between two points, we need a coordinate point at each of the intersections. Using the method described in Step 5, move the two coordinates on the first function to the points of intersection. The coordinates of the points of intersection can be found in the Report area.

a. Choose the Line Segment tool  .
b. Click on the first coordinate point to indicate the start of the line segment.
c. Then, click on the second coordinate point for the end of the line segment. After the second click, a line will be drawn connecting the two points. The slope of the line, and the distance between the two coordinate points will be displayed into the Report window.

? • **Line Segment**

11. To find the integration of the difference of two functions

a. Choose the Integral tool. The cursor changes to a cross-hair.
b. Click on the first coordinate point to indicate the starting point of the integral.
c. Then click on the second coordinate point to define the end point. The integral will be drawn in grey color. The coordinates of the two points and the value of integral will be displayed in the Report window.

Note: Since the two coordinate points were originally placed on the first function.

If you want to get rid of the integral,

a. Using the Selection tool, click on the integral. The integral highlights in yellow.
b. Type the DEL or Backspace key.

? • **Integral**

12. Adding text

The text tool can be used to enter text directly onto the Workbench, as annotations, labels, or title for your experiment. You can specify or change the text's font, font style, size, color and so on. To add text on to the Workbench,

a. Choose the Text tool  from the Tool bar. The cursor changes to a cross-hair.
b. Move the cursor to an appropriate position and click. A text object with the default word "Text" appears.
c. Double-click on the text object. A Text properties dialog appears.
d. In the text field type in "Math Experiments".
e. Set the other text properties.
f. Click OK.

? • **Text**

13. Save your experiment.
Being quite pleased with your efforts, now is a good time to save the work so far completed. Choose Save As... from the File menu.

? • **Save As...**

14. Ending your work session.
Finally, when you are ready to call it a day, select 'Quit' from the Project menu.

TUTORIAL 2: MATRIX CALCULATOR

The matrix calculator that is included in Pintar ***VirtuaLab***$_{TM}$ Mathematics performs matrix arithmetic and other matrix functions.

1. Starting a new project.

In the New sub-menu of the File menu, choose the item Matrix Calculator. A blank Matrix Calculator opens.

The Workbench is divided into two areas: Expression and Report.

2. Entering a matrix

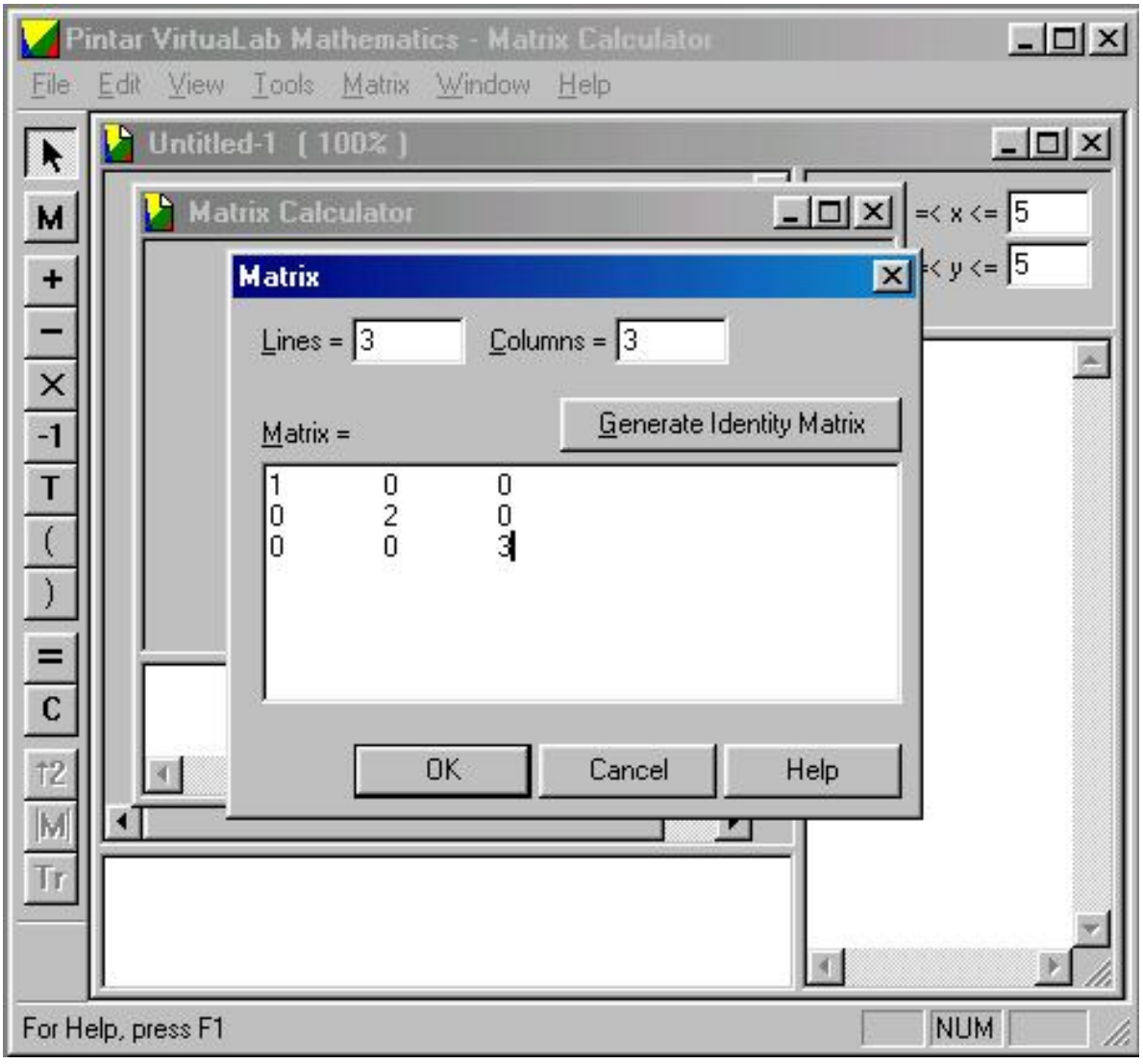
a. In the Tool bar, click on the Matrix tool  . A Matrix dialog appears. The default is a matrix with two rows and two columns.
b. Change the value for Rows (Lines) to 3 and the value for Columns to 3.
c. Click on the Generate Identity Matrix button. The contents of a three-by-three matrix is generated in the editing field. Alternatively, you can build the matrix by entering the values of the cells .....
d. Change the values in the cells of the matrix to:

1	0	0
0	2	0
0	0	3

e. Click OK. The matrix is placed in the Expression area of the Matrix Workbench.

? • **New Matrix...**

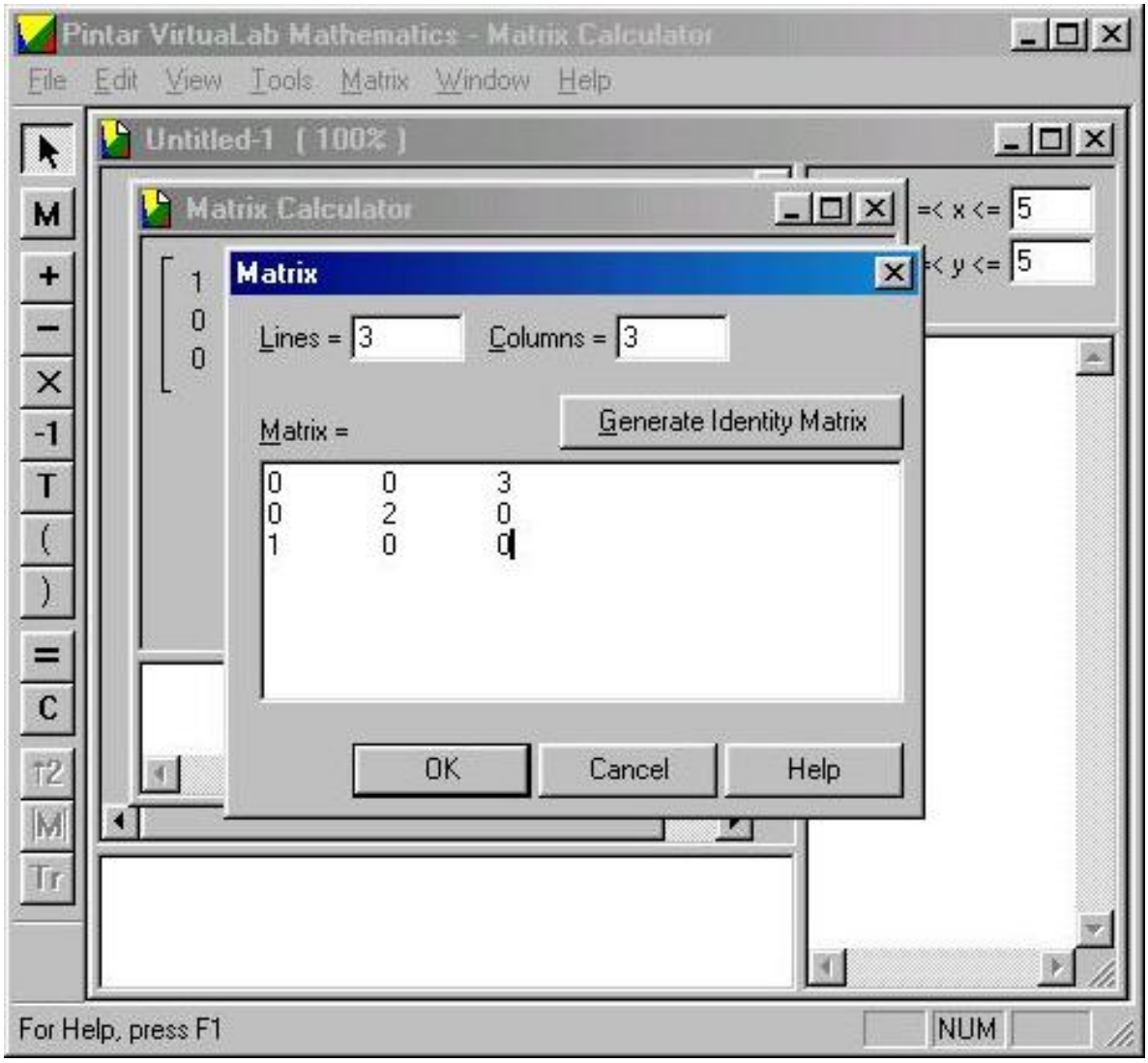
? • **The Matrix dialog**



3. To create a simple matrix expression

a. Click on the Addition operator in the Tool bar. The operator is concatenated behind the matrix.
b. Add another matrix to the expression by repeating Step 2.
c. This time set the matrix to:

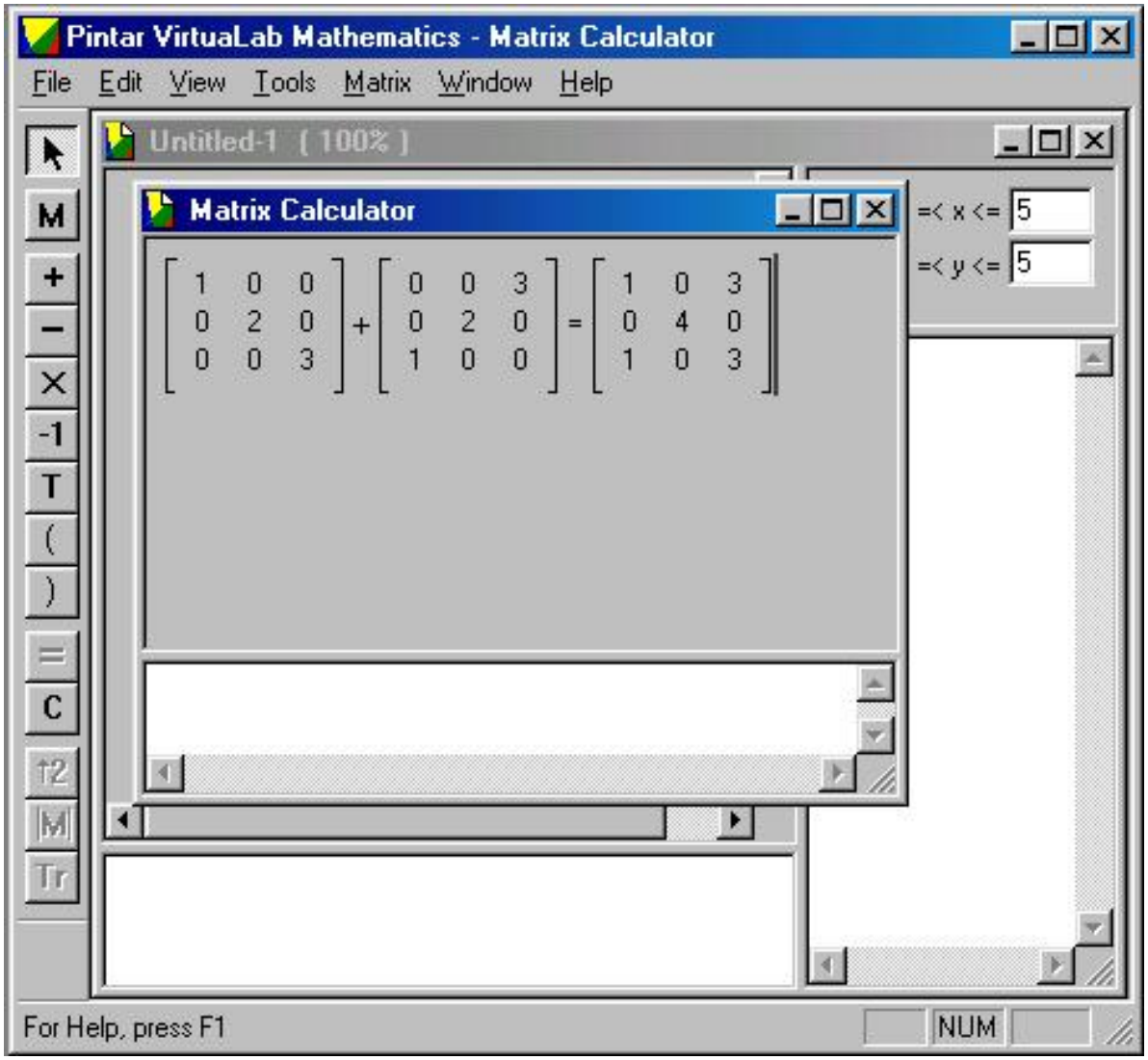
0	0	3
0	2	0
1	0	0



4. To find the result of the matrix expression

Click on the Result icon  in the Tool bar. The matrix expression is evaluated and the result is concatenated with an "=" sign and put after the expression in the Expression area.

? • **Result**



5. To edit a matrix expression

a. Double-click on the first matrix. The Matrix dialog opens.
b. Change the value of a cell.
c. Click OK. The change is reflected in the Expression area, and the "=" sign and result disappears.

6. To add a matrix

a. In the Expression area, move the cursor to the position between the "+" sign and the second matrix.
b. Add another matrix by following Step 2. Set the matrix to:

0	1	0
0	2	0
0	3	0

c. Add a subtraction operator between the second and third matrix.
d. Evaluate the expression.

7. To delete an element from a matrix expression

a. Select the element in the expression by clicking on it.
b. Type the DEL key.

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