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## **DISCLAIMER**

This software has been thoroughly tested, *however...*

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( "THE AUTHOR" SHALL MEAN *DAVID T. OSSORIO*)

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**Cloning the current matrix**

To copy the current matrix, select a matrix in the list box and click the "Okay" button. The current matrix will be copied into the selected matrix.

## Getting started with Matrix Lab

Welcome to Matrix Lab 1.0. Matrix Lab is essentially a calculator that works with matrices instead of numbers. Using Matrix Lab, matrices are easily defined and can be saved to a file, and once defined, are easy to work with. All of the basic matrix operations are supported, including multiplication, determinants, inverses, etc. Matrix elements may be either complex numbers, real numbers, or fractions. With all of these operations, the emphasis is on an easy to use and intuitive interface; Matrix Lab makes working with matrices as painless as possible.

### The Matrix Lab Document

A *document* in Matrix Lab is a set of 16 matrices. Each matrix is identified by a letter (A-P), and its size can be up to eight rows by eight columns. Also associated with each matrix is a memo field which can optionally be used to enter a comment. Documents are saved and retrieved using the normal File Open and File Save commands. Matrix Lab documents have the extension **.mtx**.

### The Matrix Lab Main Form

The *Main Form* appears when you start Matrix Lab. The *main list box* at the bottom of the screen lists all sixteen matrices, along with their sizes and any comments you may have entered for them. One of the sixteen matrices is always selected in the main list box. Above the main list box are sixty seven edit boxes where you can edit the elements of the matrix, it's size, and comments. Selecting a new matrix in the list box automatically fills the edit boxes above with the appropriate information.

See also: [Entering numeric values in the Main Form.](#)

### The Current Matrix

Almost all Matrix Lab operations (inverse, determinant, etc.) operate on the *Current Matrix*. The Current Matrix is simply the matrix represented by the values you have showing on the form *at this moment*. For example, if you have selected 2 in the **Rows** and **Cols** list boxes and have filled in the element edit boxes with zero, then the "Current Matrix" is a 2x2 matrix whose entries are all zero.

### The Update Button

The *Current Matrix* is not saved (copied) to the *main list box* until you click the *Update* button. Clicking the Update button copies the current matrix into the matrix you have selected in the main list box. You will notice that when you do this the list box is updated with the new row,column and description text you have entered.

### The Restore Button

The *Restore* button simply copies the matrix *last saved to the main list box* (with the *Update* button) into the *main form*, thus making it the current matrix.

The above is all you need to know to get started with Matrix Lab. Once you have entered a matrix on the main form, you can select menu items to perform operations on that matrix (the current matrix). The result of any operation is always displayed on the main form, so you can immediately see the result of a matrix computation.

**Registration Form**

**0000-02**

This form can be printed by selecting File/Print Topic from the Windows Help menu above. If you are unable to print this from then you can:

- 1) Print the ASCII file MATRIXLB.REG (in NOTEPAD, for example) OR...
- 2) Send the information requested below, with payment, to the address given.

---

**Matrix Lab Version 1.00 Registration Form**

*Please Print*

**Name:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**City:** \_\_\_\_\_ **State:** \_\_\_\_ **Zip** \_\_\_\_\_

**Phone (optional) (\_\_\_\_\_) \_\_\_\_\_** **Country:** \_\_\_\_\_

**Where did you obtain your copy of Matrix Lab?**

\_\_\_\_\_

**Registration Fee** (includes shipping & handling): **\$35.00** \$ \_\_\_\_\_

**Complete Visual C++ Source Code on Disk:** (optional) **\$30.00** \$ \_\_\_\_\_

Note: a *printed copy* of the complete source code is included in the \$35.00 basic registration fee.

*The optional disk includes everything you need to build Matrix Lab using Visual C++ (even the on-line help .RTF files!)*

**Total:** \$ \_\_\_\_\_

**Disk Size (circle one):** **5.25 High Density**      **3.5 High Density**      **3.5 Low Density**

Company and personal checks are accepted as well as money orders. The amount shown above is in U.S. dollars. All checks in U.S. funds must be drawn on a U.S. bank. For uses outside the U.S., checks are accepted in your local currency from users in Canada, United Kingdom, Mexico, France, Germany, Spain, Japan, The Netherlands, Australia, New Zealand, Sweden, Norway, and Denmark. (Please send U.S. funds if you are able to. Users in the United States must send U.S. funds).

Please make checks payable to: David Ossorio

Send To:

David Ossorio  
325 S. Washington Ave. #166  
Kent, WA 98032

*Thank you for registering!*

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325 S. Washington Ave. #166  
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See Also:

[Benefits of Registration](#)  
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[About Shareware](#)

## About Shareware

This software is being distributed as **Shareware**. This means that you have a fully functioning copy of the software to "try before you buy". There is an examination period of 30 days. If after 30 days you are still using the software then you **must** register it. To register, simply print the [Registration Form](#) and send it with payment to the indicated address. If you wish to register this software for more than one computer, then see [Site License Information](#). Thus you can find out if the software fully meets your needs *before* you purchase it. Naturally, you are encouraged to make and distribute as many copies as you wish of the **mlab100.zip** file.

Shareware authors such as myself fully trust that if you find this software useful, you will register it. We believe that the vast majority of people are honest and will pay for software that they use beyond the 30 day evaluation period.

Please register today!

See Also:

[Benefits of Registration](#)

## **Benefits of registration**

When you register this software, you will receive:

- The right to continue using Matrix Lab.
- The latest version of Matrix Lab. You will be assured that any last minute improvements/enhancements will be included in the registered version.
- Free unlimited technical support via phone/fax, mail, or E-Mail for a period of three years.
- A printed copy of the complete **Visual C++ (tm)** source code for Matrix Lab (Matrix Lab was written in C++ using MFC 2.0). (Complete source code is also available on disk for an additional fee.)
- Updates for the price of a disk & postage.

### **But wait!! That's not all!!**

- No more annoying SHAREWARE reminder screens!
- Your name appears in the "About" box.

See Also:

[About Shareware  
Registration Form](#)

## How To ...

Create a matrix

Edit matrix entries

Find the determinant of the current matrix

Add, Subtract, or Multiply matrices

Multiply the current matrix by a real or complex scalar

Find the conjugate of the current matrix

Find the inverse of current matrix

Row-reduce the current matrix

Find the transpose of the current matrix

Fill the current matrix with zeros

Set the current matrix to the identity matrix

## How to create a matrix

To create a matrix, simply select the number of rows and columns from the **Rows** and **Columns** list box. You may then edit the matrix elements (that is, enter the numbers which form the matrix). Click the **Update** button to copy the matrix to the matrix list box. Select **Save** or **Save As** from the file menu to save all sixteen matrices in the matrix list box to a disk file.

## How to edit matrix entries

Matrix elements may be fractions, real numbers, or complex numbers.

### Fractions

To enter a fraction as a matrix element, simply type the numerator followed by a slash (/) and then the denominator. Both the numerator and denominator must be integers. Here are some examples of legal fractions in Matrix Lab:

1/2  
0/3  
3465/10983  
34 / 54  
0 / 1  
(note that spaces are ignored)

Fractions are automatically reduced. For example, if you enter 6/8 as an element in the current matrix, when you update the current matrix or perform any matrix operation on it, this is changed to 3/4.

The only restriction on fractions is the numerator and denominator must be real integers in the range  $-(2^{31})$  to  $(2^{31})-1$ .

### Real Numbers

Real numbers are entered as you normally would in a calculator. Here are some examples of legal real numbers:

1  
2e10  
3.43  
-0.10

If a real number does not have any digits after the decimal point and is small enough to be represented by a signed long integer, then it is automatically converted to a fraction type, so entering 7, for example, is equivalent to entering 7/1. If you want to force floating point computations, then you can enter 7.0.

### Complex numbers

Complex numbers are identical to real numbers except that they are entered in pairs. The real part of the number is separated by the imaginary part with a comma. Here are some examples of legal complex numbers:

1,-1	( 1 - 1i)
0,-1	( 0 - 1i)
3.65,0.34e10	(3.65 + 34e10i)
0,0	(0 + 0i)

Alternatively, you can enter a complex number using the usual  $a+bi$  notation. The only restriction is that if you use this syntax you must enter values for both  $a$  and  $b$ , followed by the letter  $i$ . Formally, the syntax is:

**a [+|-] bi**, where **a** and **b** are real numbers.

For example,

3+1i (valid)  
3+i (not valid)

0-4i (valid)  
4i (not valid)  
0-4 (not valid)  
0+-4i (not valid)

Internally, Matrix Lab treats real numbers as complex numbers with the imaginary part equal to 0.0, so there are really only two matrix element types.

Note that for large matrices (7x7 or above), or matrices with large numerical entries, you may have to use real number entries if you are going to be computing a determinant or inverse (but see the warning below). The reason for this is that since fractions are stored as integers, they can easily overflow when multiplied together. Matrix Lab will warn you if integer overflow has occurred and prompt you repeat the selected operation using floating point (Real or Complex) numbers.

Note also that when using complex numbers with both real and imaginary parts, floating point roundoff error can accumulate fairly rapidly when performing certain operations such as computing inverses for large matrices, since these operations can require tens of thousands of individual floating point computations. Roundoff error does not seem to be as much of a problem when **real** numbers are used (that is, imaginary part = 0.0). Unfortunately, nothing could be done about this in the current release of Matrix Lab.

(Matrix Lab will use a floating point coprocessor if you have one (I don't), so in that case roundoff error might be less of a problem).

See Also: [Rules for combining matrix elements.](#)

## Rules for combining matrix elements

When performing matrix calculations (addition, multiplication, determinant, row reduction, etc.), Matrix Lab combines elements as follows: (where @ is a binary operator such as multiplication, addition, or subtraction)

Fraction @ Fraction	=	Fraction
Fraction @ Complex/Real	=	Complex/Real
Complex/Real @ Fraction	=	Complex/Real
Complex/Real @ Complex/Real	=	Complex/Real

You can see that only if both elements are fractions will the result of a computation be a fraction. Therefore, it is best to make all elements in a matrix fractions if at least one of them is a fraction.

## How to find the determinant the current matrix

To find the determinant of the current matrix, click the **Determinant** Toolbar button  or select **Determinant** from the operations menu.

Almost all Matrix Lab operations (inverse, determinant, etc.) operate on the *Current Matrix*. The Current Matrix is simply the matrix represented by the values you have showing on the form *at this moment*. For example, if you have selected 2 in the **Rows** and **Cols** list boxes and have filled in the element edit boxes with zero, then the "Current Matrix" is a 2x2 matrix whose entries are all zero.

## How to add, subtract or multiply two matrices

To add, subtract, or multiply two matrices together, simply click the appropriate Toolbar button 



or select from the [math menu](#).

A dialog box will be displayed prompting you for the first and second arguments. The result is always displayed in the main form (and becomes the [current matrix](#)).

## **How to multiply the current matrix by a scalar**

To multiply the current matrix by a scalar, simply select that operation from the Math menu. A dialog box will be displayed prompting you for the scalar. Each element of the current matrix will be multiplied by the scalar you enter here, which can be a fraction, real, or complex number.

For the syntax of entering the scalar in the dialog box, see:

[How to edit matrix entries](#)

## How to find the conjugate of the current matrix

To find the conjugate of the current matrix, simply click the **conjugate** Toolbar button , or select **Conjugate** from the operations menu

## How to find the inverse of a matrix

To find the inverse of the current matrix, simply click the **inverse** Toolbar button  or select **Inverse** from the operations menu

If the determinant of the current matrix is zero, a message box will display informing you that the current matrix does not have an inverse.

## How to row reduce the current matrix

Matrix Lab defines three types of row reduction:

### Row Reduce

Selecting **Row Reduce** from the operations menu will change the current matrix, using elementary row operations, as follows:

The number of zero's preceding the first non zero entry of a row increases or remains the same row by row until only zero rows remain (if there are any zero rows). This is usually defined as *row echelon form*, however, Matrix Lab uses that definition only if all leading entries are 1. Here are a few examples of row reduced matrices:

3 2 0 5	2 3	3 4 5
0 1 2 3	0 5	0 0 4
0 0 1 1		0 0 1
0 0 0 0		

### Row Echelon Reduce

Selecting **Row Echelon Reduce** from the operations menu will first **Row Reduce** the current matrix as described above, and then change the leading non-zero entries to **1** using elementary row operations. Here are a few examples of row echelon reduced matrices:

1 2 0 5	1 3	1 4 5
0 1 2 3	0 1	0 0 1
0 0 1 1		0 0 0
0 0 0 1		

### Row Canonical Reduce

Selecting **Row Canonical Reduce** from the operations menu will first **Row Echelon Reduce** the current matrix as described above, and then change the entries *above* the leading **1's** to zeros using elementary row operations.

Here are a few examples of row canonical reduced matrices:

1 0 0 5	1 0 0	1 0 0 4
0 1 0 4	0 1 0	0 0 1 3
0 0 1 5	0 0 1	0 0 0 0

## How to find the transpose of the current matrix

To find the transpose of the current matrix, simply click the **Transpose** Toolbar button , or select **Transpose** from the operations menu

## How to fill the current matrix with zeros

To change the current matrix into the zero matrix (fill with zero's), click the **Fill Zero** Toolbar button  , or select **Fill Zero** from the operations menu

## How set the current matrix to the identity matrix

To change the current matrix into the identity matrix, click the **Fill Identity** Toolbar button  , or select **Fill Identity** from the operations menu

## **\_Commands**

File menu

Edit menu

View menu

Matrix menu

Operations menu

Math menu

Window menu

Help menu

## Definition of Row Echelon Form

In Matrix Lab, a matrix is in *Row Echelon Form* if and only if:

- 1) The number of leading zeros increases or stays the same row by row until only zero rows remain (if there are any zero rows).
- 2) The leading non-zero entries of each row are **1**.

Examples:

1 2 0 5	1 3	1 4 5
0 1 2 3	0 1	0 0 1
0 0 1 1		0 0 0
0 0 0 1		

## Row Canonical Form

In Matrix Lab, a matrix is in *Row Canonical Form* if and only if:

- 1) It is in row echelon form
- 2) For each non-zero leading entry, there are zero entries directly above it.

Examples:

1 0 0 5	1 0 0	1 0 0 4
0 1 0 4	0 1 0	0 0 1 3
0 0 1 5	0 0 1	0 0 0 0

## Matrix menu commands

The Matrix menu offers the following commands:

<u>Set Undefined</u>	Sets the <u>current matrix</u> to an undefined state.
<u>Clone</u>	Copies the <u>current matrix</u> to a selected matrix record.
<u>Update</u>	Transfers the <u>current matrix</u> to the selected matrix record.
<u>Restore</u>	Transfers the last updated matrix to the <u>current matrix</u> .
<u>Convert to floating point</u>	Converts any fraction (integer) elements in the <u>current matrix</u> to floating point complex elements.
<u>Convert to fraction</u>	Converts any floating point elements in the <u>current matrix</u> to fraction (integers).

### **Set Undefined Command (Matrix menu)**

Use this command to set the current matrix to an undefined state.

### **Shortcuts**

Keys: CTRL+SHIFT+U

### **Clone (Matrix menu)**

Use this command to copy the current matrix to another matrix.

### **Shortcuts**

Keys:           CTRL+L

## Update (Matrix menu)

Use this command to copy the current matrix to the matrix selected in the *matrix list box*.

## Shortcuts

Main Form:	<b>Update</b> button
Keys:	CTRL+U

## **Restore (Matrix menu)**

Use this command to restore the matrix last saved with the Update command to the current matrix.

### **Shortcuts**

Main Form: **Restore** button

Keys: CTRL+R

### **Convert to Floating Point (Matrix menu)**

Use this command to change each element of the current matrix into a complex/real number. If an element is already a complex/real number, then it is unchanged.

### **Shortcuts**

Keys:           CTRL+P

### **Convert to Fraction (Matrix menu)**

Use this command to change each element of the current matrix into a fraction. If an element is complex/real, then it will only be converted to a fraction if it is a non-zero integer in the range  $-(2^{31})$  to  $(2^{31})-1$ .

### **Shortcuts**

Keys: CTRL+F

## Math menu commands

<u>Add</u>	Adds two matrices together.
<u>Subtract</u>	Subtracts two matrices.
<u>Multiply</u>	Multiplies two matrices together.
<u>Multiply by a scalar</u>	Multiplies the current matrix by a scalar.
<b>Add (Math menu)</b>	

Use this command to add two matrices together. The result of the addition is always display in the *main form* (and becomes the current matrix.)

## Shortcuts

Toolbar:   
Keys: CTRL+A

## Subtract (Math menu)

Use this command to subtract two matrices. The result of the subtraction is always display in the *main form* (and becomes the current matrix.)

### Shortcuts

Toolbar: 

Keys

CTRL+B

## Multiply (Math menu)

Use this command to multiply two matrices together. The result of the multiplication is always display in the *main form* (and becomes the current matrix.)

### Shortcuts

Toolbar: 

Keys

CTRL+M

## **Multiply by a Scalar**

Use this command to multiply the current matrix by a scalar. Each element of the current matrix will be multiplied by the number specified in the dialog box.

### **Shortcuts**

Keys:           CTRL+SHIFT+M

## Operations menu commands

The Operations menu offers the following commands:

<u>Fill Identity</u>	Sets the <u>current matrix</u> to the identity matrix.
<u>Fill Zero</u>	Sets the <u>current matrix</u> to the zero matrix.
<u>Negate</u>	Negates the <u>current matrix</u>
<u>Transpose</u>	Transposes the <u>current matrix</u>
<u>Row Reduce</u>	Row reduces the <u>current matrix</u> .
<u>Row Echelon Reduce</u>	Reduces the <u>current matrix</u> to row echelon form.
<u>Row Canonical Reduce</u>	Reduces the <u>current matrix</u> to row canonical form.
<u>Inverse</u>	Computes the inverse of the <u>current matrix</u>
<u>Determinant</u>	Computes the determinant of the <u>current matrix</u>
<u>Conjugate</u>	Computes the conjugate of the <u>current matrix</u>

### Fill Identity (Operations menu)

Use this command to change the current matrix into the identity matrix.

### Shortcuts

Toolbar: 

Keys: CTRL+Y

## Fill Zero (Operations menu)

Use this command to set the current matrix to the zero matrix.

### Shortcuts

Toolbar: 

Keys: CTRL+E

## Negate (Operations menu)

Use this command to compute the negative of the current matrix.

### Shortcuts

Toolbar: 

Keys: CTRL+G

## Transpose (Operations menu)

Use this command to compute the transpose of the current matrix.

### Shortcuts

Toolbar: 

Keys: CTRL+T

### **Row Reduce (Operations menu)**

Use this command to row reduce the current matrix.

### **Shortcuts**

Keys: F2

## Row Echelon Reduce (Operations menu)

Use this command to reduce the current matrix to row echelon form.

### Shortcuts

Keys: F3

### **Row Canonical Reduce (Operations menu)**

Use this command to reduce the current matrix to row canonical form.

### **Shortcuts**

Keys:            F4

## Inverse (Operations menu)

Use this command to find the inverse of the current matrix.

### Shortcuts

Toolbar: 

Keys: CTRL+I

## Determinant (Operations menu)

Use this command to find the determinant of the current matrix.

### Shortcuts

Toolbar: 

Keys: CTRL+D

## Conjugate (Operations menu)

Use this command to find the conjugate of the current matrix.

### Shortcuts

Toolbar: 

Keys: None.

## File menu commands

The File menu offers the following commands:

<u>New</u>	Creates a new <u>document</u> .
<u>Open</u>	Opens an existing <u>document</u> .
<u>Close</u>	Closes an opened <u>document</u> .
<u>Save</u>	Saves an opened <u>document</u> using the same file name.
<u>Save As</u>	Saves an opened <u>document</u> to a specified file name.
<u>Exit</u>	Exits Matrix Lab.

## **Edit menu commands**

The Edit menu offers the following commands:

<u>Undo</u>	Reverse previous editing operation.
<u>Cut</u>	Deletes data from the currently selected edit box and moves it to the clipboard.
<u>Copy</u>	Copies data from the currently selected edit box to the clipboard.
<u>Paste</u>	Pastes data from the clipboard into the currently selected edit box.

## **View menu commands**

The View menu offers the following commands:

Toolbar       Shows or hides the toolbar.  
Status Bar    Shows or hides the status bar.

## **Window menu commands**

The Window menu offers the following commands, which enable you to arrange multiple views of multiple documents in the application window:

New Window    Creates a new window that views the same document.  
Cascade        Arranges windows in an overlapped fashion.  
Tile            Arranges windows in non-overlapped tiles.  
Arrange Icons   Arranges icons of closed windows.  
Window 1, 2, ...   Goes to specified window.

## Help menu commands

The Help menu offers the following commands, which provide you assistance with this application:

<u>I</u> ndex	Offers you an index to topics on which you can get help.
<u>U</u> sing	Provides general instructions on using help.
<u>H</u> elp	
<u>A</u> bout	Displays the version number of Matrix Lab.

## **New command (File menu)**

Use this command to create a new document in Matrix Lab.  
You can open an existing document with the Open command.

## **Shortcuts**

Toolbar:   
Keys: CTRL+N

## Open command (File menu)

Use this command to open an existing document in a new window. You can open multiple documents at once. Use the Window menu to switch among the multiple open documents. See Window 1, 2, ... command.

You can create new documents with the New command.

## Shortcuts

Toolbar:   
Keys: CTRL+O

## **File Open dialog box**

The following options allow you to specify which file to open:

### **File Name**

Type or select the filename you want to open. This box lists files with the extension you select in the List Files of Type box.

### **List Files of Type**

Select the type of file you want to open:

Matrix Lab always creates files with the extension **.mtx**

### **Drives**

Select the drive in which Matrix Lab stores the file that you want to open.

### **Directories**

Select the directory in which Matrix Lab stores the file that you want to open.

### **Network...**

Choose this button to connect to a network location, assigning it a new drive letter.

## Close command (File menu)

Use this command to close all windows containing the active document. Matrix Lab suggests that you save changes to your document before you close it. If you close a document without saving, you lose all changes made since the last time you saved it. Before closing an untitled document, Matrix Lab displays the Save As dialog box and suggests that you name and save the document.

You can also close a document by using the Close icon on the document's window, as shown below:



## Save command (File menu)

Use this command to save the active document to its current name and directory. When you save a document for the first time, Matrix Lab displays the Save As dialog box so you can name your document. If you want to change the name and directory of an existing document before you save it, choose the Save As command.

## Shortcuts

Toolbar:   
Keys: CTRL+S

**Save As command (File menu)**

Use this command to save and name the active document. Matrix Lab displays the Save As dialog box so you can name your document.

To save a document with its existing name and directory, use the Save command.

## **File Save As dialog box**

The following options allow you to specify the name and location of the file you're about to save:

### **File Name**

Type a new filename to save a document with a different name. A filename can contain up to eight characters and an extension of up to three characters. Matrix Lab adds the extension you specify in the Save File As Type box.

### **Drives**

Select the drive in which you want to store the document.

### **Directories**

Select the directory in which you want to store the document.

### **Network...**

Choose this button to connect to a network location, assigning it a new drive letter.

### **1, 2, 3, 4 command (File menu)**

Use the numbers and filenames listed at the bottom of the File menu to open the last four documents you closed. Choose the number that corresponds with the document you want to open.

## Exit command (File menu)

Use this command to end your Matrix Lab session. You can also use the Close command on the application Control menu. Matrix Lab prompts you to save documents with unsaved changes.

### Shortcuts

Mouse: Double-click the application's Control menu button.



Keys: ALT+F4

### **Undo/Can't Undo command (Edit menu)**

Use this command to reverse the last editing action, if possible. The name of the command changes, depending on what the last action was. The Undo command changes to Can't Undo on the menu if you cannot reverse your last action.

### **Shortcuts**

Keys: CTRL+Z or  
ALT-BACKSPACE

## **Cut command (Edit menu)**

Use this command to remove the currently selected data from the currently selected edit box and put it on the clipboard. This command is unavailable if there is no data currently selected.

Cutting data to the clipboard replaces the contents previously stored there.

## **Shortcuts**

Toolbar:   
Keys: CTRL+X

## **Copy command (Edit menu)**

Use this command to copy selected data onto the clipboard. This command is unavailable if there is no data currently selected.

Copying data to the clipboard replaces the contents previously stored there.

## **Shortcuts**

Toolbar:   
Keys: CTRL+C

## Paste command (Edit menu)

Use this command to insert a copy of the clipboard contents at the insertion point. This command is unavailable if the clipboard is empty.

## Shortcuts

Toolbar:   
Keys: CTRL+V

**Toolbar command (View menu)**

Use this command to display and hide the Toolbar, which includes buttons for some of the most common commands in Matrix Lab, such as File Open. A check mark appears next to the menu item when the Toolbar is displayed.

See [Toolbar](#) for help on using the toolbar.

## Toolbar



The toolbar is displayed across the top of the application window, below the menu bar. The toolbar provides quick mouse access to many tools used in Matrix Lab,

To hide or display the Toolbar, choose Toolbar from the View menu (ALT, V, T).

### Click To

---



Open a new document.



Open an existing document. Matrix Lab displays the Open dialog box, in which you can locate and open the desired file.



Save the active document or template with its current name. If you have not named the document, Matrix Lab displays the Save As dialog box.



Remove selected data from the document and stores it on the clipboard.



Copy the selection to the clipboard.



Insert the contents of the clipboard at the insertion point.



Fill the current matrix with zeros.



Change the current matrix into the identity matrix.



Negate the current matrix.



Transpose the current matrix.



Find the inverse of the current matrix.



Find the determinant of the current matrix.



Find the conjugate of the current matrix.



Add two matrices together.



Subtract two matrices.



Multiply two matrices together.

**Status Bar command (View menu)**

Use this command to display and hide the Status Bar, which describes the action to be executed by the selected menu item or depressed toolbar button, and keyboard latch state. A check mark appears next to the menu item when the Status Bar is displayed.

See [Status Bar](#) for help on using the status bar.

## Status Bar



The status bar is displayed at the bottom of the Matrix Lab window. To display or hide the status bar, use the Status Bar command in the View menu.

The left area of the status bar describes actions of menu items as you use the arrow keys to navigate through menus. This area similarly shows messages that describe the actions of toolbar buttons as you depress them, before releasing them. If after viewing the description of the toolbar button command you wish not to execute the command, then release the mouse button while the pointer is off the toolbar button.

The right areas of the status bar indicate which of the following keys are latched down:

<b>Indicator</b>	<b>Description</b>
CAP	The Caps Lock key is latched down.
NUM	The Num Lock key is latched down.
SCRL	The Scroll Lock key is latched down.

**New command (Window menu)**

Use this command to open a new window with the same contents as the active window. You can open multiple document windows to display different parts or views of a document at the same time. If you change the contents in one window, all other windows containing the same document reflect those changes. When you open a new window, it becomes the active window and is displayed on top of all other open windows.

**Cascade command (Window menu)**

Use this command to arrange multiple opened windows in an overlapped fashion.

**Tile command (Window menu)**

Use this command to arrange multiple opened windows in a non-overlapped fashion.

**Tile Horizontal command (Window menu)**

Use this command to vertically arrange multiple opened windows in a non-overlapped fashion.

**Tile Vertical command (Window menu)**

Use this command to arrange multiple opened windows side by side.

### **Window Arrange Icons Command**

Use this command to arrange the icons for minimized windows at the bottom of the main window. If there is an open document window at the bottom of the main window, then some or all of the icons may not be visible because they will be underneath this document window.

### **1, 2, ... command (Window menu)**

Matrix Lab displays a list of currently open document windows at the bottom of the Window menu. A check mark appears in front of the document name of the active window. Choose a document from this list to make its window active.

**Index command (Help menu)**

Use this command to display the opening screen of Help. From the opening screen, you can jump to step-by-step instructions for using Matrix Lab and various types of reference information.

Once you open Help, you can click the Contents button whenever you want to return to the opening screen.

## **Using Help command (Help menu)**

Use this command for instructions about using Help.

**About command (Help menu)**

Use this command to display the copyright notice and version number of your copy of Matrix Lab.

## Context Help command



Use the Context Help command to obtain help on some portion of Matrix Lab. When you choose the Toolbar's Context Help button, the mouse pointer will change to an arrow and question mark. Then click somewhere in the Matrix Lab window, such as another Toolbar button. The Help topic will be shown for the item you clicked.

## Shortcut

Keys:       SHIFT+F1

## **Title Bar**

The title bar is located along the top of a window. It contains the name of the application and document.

To move the window, drag the title bar. Note: You can also move dialog boxes by dragging their title bars.

A title bar may contain the following elements:

- Application Control-menu button
- Document Control-menu button
- Maximize button
- Minimize button
- Name of the application
- Name of the document
- Restore button

**Scroll bars**

Displayed at the right and bottom edges of the document window. The scroll boxes inside the scroll bars indicate your vertical and horizontal location in the document. You can use the mouse to scroll to other parts of the document.

### **Size command (System menu)**

Use this command to display a four-headed arrow so you can size the active window with the arrow keys.



After the pointer changes to the four-headed arrow:

1. Press one of the DIRECTION keys (left, right, up, or down arrow key) to move the pointer to the border you want to move.
2. Press a DIRECTION key to move the border.
3. Press ENTER when the window is the size you want.

Note: This command is unavailable if you maximize the window.

### **Shortcut**

Mouse: Drag the size bars at the corners or edges of the window.

### **Move command (Control menu)**

Use this command to display a four-headed arrow so you can move the active window or dialog box with the arrow keys.



Note: This command is unavailable if you maximize the window.

### **Shortcut**

Keys: CTRL+F7

### **Minimize command (application Control menu)**

Use this command to reduce the Matrix Lab window to an icon.

### **Shortcut**

Mouse: Click the minimize icon  on the title bar.  
Keys: ALT+F9

## **Maximize command (System menu)**

Use this command to enlarge the active window to fill the available space.

### **Shortcut**

Mouse: Click the maximize icon  on the title bar; or double-click the title bar.

Keys: CTRL+F10 enlarges a document window.

### **Next Window command (document Control menu)**

Use this command to switch to the next open document window. Matrix Lab determines which window is next according to the order in which you opened the windows.

### **Shortcut**

Keys: CTRL+F6

### **Previous Window command (document Control menu)**

Use this command to switch to the previous open document window. Matrix Lab determines which window is previous according to the order in which you opened the windows.

#### **Shortcut**

Keys:       SHIFT+CTRL+F6

## Close command (Control menus)

Use this command to close the active window or dialog box.

Double-clicking a Control-menu box is the same as choosing the Close command.



Note: If you have multiple windows open for a single document, the Close command on the document Control menu closes only one window at a time. You can close all windows at once with the Close command on the File menu.

## Shortcuts

Keys:      CTRL+F4 closes a document window  
              ALT+F4 closes the main window or dialog box

**Restore command (Control menu)**

Use this command to return the active window to its size and position before you chose the Maximize or Minimize command.

## **Switch to command (application Control menu)**

Use this command to display a list of all open applications. Use this "Task List" to switch to or close an application on the list.

### **Shortcut**

Keys: CTRL+ESC

### **Dialog Box Options**

When you choose the Switch To command, you will be presented with a dialog box with the following options:

#### **Task List**

Select the application you want to switch to or close.

#### **Switch To**

Makes the selected application active.

#### **End Task**

Closes the selected application.

#### **Cancel**

Closes the Task List box.

#### **Cascade**

Arranges open applications so they overlap and you can see each title bar. This option does not affect applications reduced to icons.

#### **Tile**

Arranges open applications into windows that do not overlap. This option does not affect applications reduced to icons.

#### **Arrange Icons**

Arranges the icons of all minimized applications across the bottom of the screen.

## **Modifying the Document**

See [Getting started with Matrix Lab](#)

**Overflow**

An integer calculation has overflowed. You should repeat the selected matrix operations using real/complex numbers.

**Bad file format**

The file which you attempted to open was not created with Matrix Lab or has been corrupted.

### **No inverse help**

Matrices with determinants equal to zero (singular) do not have inverses).

**No Help Available**

No help is available for this area of the window.

**No Help Available**

No help is available for this message box.

A *document* in Matrix Lab is a set of 16 matrices. Each matrix is identified by a letter (A-P), and its size can be up to eight rows by eight columns. Also associated with each matrix is a memo field which can optionally be used to enter a comment. Documents are saved and retrieved using the normal File Open and File Save commands. Matrix Lab documents have the extension **.mtx**.

## **Scalar Multiplication**

Enter a number in the Edit Box exactly as you would in the main form (this can be a fraction, real, or complex number). Each element of the current matrix will be multiplied by the number entered.

See Also:

[Editing numbers](#)

## Operators

To add, subtract, or multiply two matrices together:

- 1) Select the 1st matrix in the "operator 1" edit box.
- 2) Select the operator (+, -, or \*).
- 3) Select the 2nd matrix in the "operator 2" edit box.

The result of the computation is always placed in the main form and becomes the current matrix.

For example, if you select **A** in the *operator 1* edit box and **C** in the *operator 2* edit box and the '+' operator, the **A+B** is displayed in the main form.

