# The Mathcad Working Model

**What Mathcad can do...**

**How to try it out...**

**Menu commands...**

**Context sensitive help on:**
>functions
>error messages
>operators
>palette buttons
>menu commands

**Help on functions**

To learn what a specific function does:
- Choose **Insert Function** from the **Math** menu.
- Click on the name of the function in the left-hand scrolling list.
- Look on the right-hand scrolling list to see what the function does.

**Help on error messages**

If you want to know more about what a particular error messages means:
- Press **Shift+F1**.
- Click on the error messages you're interested in.
- When you're done, press **Esc**.

**Help on operators and Greek letters**

To get help on anything appearing on the palette along the left side of the window:
- Press **Shift+F1**.
- Click on the palette button you're interested in and read the message line at the bottom of the window.
- When you're done, press **Esc**.

**Help on menu commands**

For help on menu commands:
- Press **Shift+F1**.
- Click on the menu command you're interested in.
- When you're done, press **Esc**.

**What Mathcad can do**

To learn more about what Mathcad can do, choose **Open Mathcad Demo** from the **Books** menu. This opens a live interactive document demonstrating many of Mathcad's features.

**Trying out Mathcad**

To try out some of Mathcad's features, choose **Open Scratchpad** from the **Books** menu. This will open up a window in which you can try out many of the features you learned about in the Mathcad Demo Book.

## MENU COMMANDS

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## BOOKS MENU

**Books ⇒ Open Mathcad Demo**
**Books ⇒ Open Scratchpad**
**Books ⇒ Search Book...**
**Books ⇒ Close**
**Books ⇒ Exit**

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# EDIT MENU

**Edit ⇒ Undo Last Edit**
**Edit ⇒ Cut**
**Edit ⇒ Copy**
**Edit ⇒ Paste**
**Edit ⇒ View Regions**
**Edit ⇒ Insert Pagebreak**
**Edit ⇒ Set Right Margin**
**Edit ⇒ Clear Right Margin**
**Edit ⇒ Go to Page...**

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# TEXT MENU

**Text ⇒ Create Text Region**
**Text ⇒ Change Font...**
**Text ⇒ Change Default Font...**

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**MATH MENU**

**Math ⇒ Matrices...**
**Math ⇒ Built-In Variables...**
**Math ⇒ Units ⇒ Insert Unit...**
**Math ⇒ Units ⇒ Change System of Units...**
**Math ⇒ Insert Function...**
**Math ⇒ Randomize...**
**Math ⇒ Calculate**
**Math ⇒ Calculate Document**
**Math ⇒ Toggle Equation**
**Math ⇒ Automatic Mode**
**Math ⇒ Numerical Format...**
**Math ⇒ Apply Font Tag...**
**Math ⇒ Modify Font Tag...**
**Math ⇒ Change to Greek Variable**

## GRAPHICS MENU

**Graphics ⇒ Create X-Y Plot**
**Graphics ⇒ Create Polar Plot**
**Graphics ⇒ Create Surface Plot**
**Graphics ⇒ Create Contour Plot**
**Graphics ⇒ X-Y Plot Format...**
**Graphics ⇒ Polar Plot Format...**

## X-Y PLOT MENU

Available only when an x-y plot is selected.

**X-Y Plot ⇒ Format...**
**X-Y Plot ⇒ Crosshair...**
**X-Y Plot ⇒ Zoom...**
**X-Y Plot ⇒ Title...**
**X-Y Plot ⇒ Axis Labels...**

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## POLAR PLOT MENU

Available only when a polar plot is selected.

**Polar Plot ⇒ Format...**
**Polar Plot ⇒ Crosshair...**
**Polar Plot ⇒ Zoom...**
**Polar Plot ⇒ Title...**

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## CONTOUR PLOT MENU

Available only when a contour plot is selected.

**Contour Plot ⇒ Format...**
**Contour Plot ⇒ Title...**

## SURFACE PLOT MENU

Available only when a surface plot is selected.

**Surface Plot ⇒ Format...**
**Surface Plot ⇒ Title...**

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# WINDOW MENU

**Window ⇒ Cascade**
**Window ⇒ Tile**
**Window ⇒ Arrange Icons**
**Window ⇒ Zoom...**
**Window ⇒ Refresh**
**Window ⇒ Hide Palette**
**Window ⇒ Hide Tool Bar**
**Window ⇒ Hide Font Bar**
**Window ⇒ Change Colors ⇒ Background Color...**
**Window ⇒ Change Colors ⇒ Text Color...**
**Window ⇒ Change Colors ⇒ Equation Color...**
**Window ⇒ Change Colors ⇒ Annotation Color...**

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## HELP MENU

**Help ⇒ Contents...**
**Help ⇒ Keyboard...**
**Help ⇒ Using Help...**
**Help ⇒ About the Mathcad Working Model...**
**Help ⇒ What is Mathcad...**

**Books ⇒ Open Mathcad Demo...**

Opens an Electronic Book illustrating Mathcad's features and providing instructions on how to use this demo version of Mathcad.

**Books ⇒ Open Scratchpad**

Opens another window in which you can try out some of Mathcad's features to perform calculations and create plots.

**Books ⇒ Search Book...**

Opens a dialog box into which you type a string you want to search for.

**Books ⇒ Close**

Closes the active window.

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*Keyboard shortcut*          **Ctrl+F4**

**Books ⇒ Exit**

     Exits this demo.

*Keyboard shortcut*       **Alt**+**F4**

**Edit ⇒ Undo Last Edit**

Undoes your most recent edit command or keystroke.

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*Keyboard shortcut*        **Alt**+**BkSp**

**Edit ⇒ Cut**

Deletes whatever has been selected and places it on the clipboard.

Note that only the most recently cut selection is on the clipboard.

*Keyboard shortcuts*     **Ctrl+X**

**Edit ⇒ Copy**

Copies whatever has been selected to the clipboard. Following this command, you should usually choose **Paste** from the **Edit** menu.

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*Keyboard shortcuts*  Ctrl+C

**Edit ⇒ Paste**

Places whatever is in the clipboard into the document.

This operation does not change the contents of the clipboard.

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*Keyboard shortcuts*     **Ctrl+V**

**Edit ⇒ View Regions**

Encloses all regions in boxes so you can see how big they are and where their <u>anchor points</u> fall.

To restore the normal document view, choose this again.

**Edit ⇒ Insert Pagebreak**

Inserts a pagebreak wherever the cursor is located.

To delete a pagebreak, click where the line indicating the pagebreak touches the left edge of your document. Then choose **Cut** from the **Edit** menu.

**Edit ⇒ Set Right Margin**

Sets the right margin to the current location of your crosshair.

**Edit ⇒ Clear Right Margin**

Removes the right margin.

**Edit ⇒ Go to Page...**

Jumps to a particular page. Mathcad puts the top of the page you jump to at the top of your window.

**Text ⇒ Create Text Region**

Creates a region of text wherever the crosshair is. The crosshair will change into a thin vertical line. A box appears showing the extent of the text region. This box disappears when you click outside the region.

You can change the width of a text region by selecting it and dragging on the right edge of the selection rectangle with the mouse.

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*Keyboard shortcut*       **"** (double-quote)

**Text ⇒ Change Font...**

Brings up a dialog box for changing the font, size and style of selected text.

The text must be in a text band or region. To change fonts in equations, choose **Apply Font Tag** or **Modify Font Tag** from the **Math** menu.

**Text ⇒ Change Default Font...**

Brings up a dialog box for changing the default font of all text regions and text bands.

Text in fonts other than the default font is unaffected.

This command affects only text regions and text bands. To change math fonts, choose either **Apply Font Tag** or **Modify Font Tag** from the **Math** menu.

**Math ⇒ Matrices...**

Creates a vector or matrix wherever the crosshair is located.

If the crosshair is already in a vector or matrix, choosing this allows you to insert or delete a row or column.

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*Keyboard shortcut*        **Ctrl+M**

**Math ⇒ Built-In Variables...**

Changes the values of the built-in variables:
▸ **TOL**
▸ **PRNPRECISION**
▸ **ORIGIN**
▸ **PRNCOLWIDTH**

**Math ⇒ Units ⇒ Insert Unit...**

Brings up dialog box with a scrolling list of built-in units.

To express a result in one of Mathcad's built-in units:
- Click on the unit placeholder to the right of a result.
- Highlight the unit in the scrolling list of units.
- Click **Insert**. Mathcad inserts the unit and converts the result appropriately.

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*Keyboard shortcut*      **Ctrl+U**

**Math ⇒ Units ⇒ Change System of Units...**

Changes the default system of units. By default, Mathcad displays results in terms of m, kg, sec, coul and K. You can change this to CGS, US or none.

**Math ⇒ Insert Function...**

Brings up dialog box with a scrolling list of built-in functions.

To see what a particular function does, click on the function name and read the text that appears in the box on the right.

To insert a built-in function, together with the necessary placeholders:
- Highlight the function name in the scrolling list of units.
- Click **Insert**.

**Math ⇒ Randomize...**

Changes the value of the seed used in Mathcad's **rnd(x)** function to generate uniformly distributed random numbers between 0 and x.

If you choose this without changing the seed, Mathcad restarts the random number sequence using this seed value.

**Math ⇒ Calculate**

Updates all plots and numerical results on the screen. Mathcad places the words "calc F9" in the message line to let you know that the screen needs to be updated.

If you want to update all plots and numerical results throughout the document, choose **Calculate Document** from the **Math** menu instead.

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*Keyboard shortcut*          **F9**

**Math ⇒ Calculate Document**

Updates all plots and numerical results throughout the document.

If you want to update only the plots and numerical results currently displayed, choose **Calculate** from the **Math** menu instead.

**Math ⇒ Toggle Equation**

Makes Mathcad ignore a selected equation in all calculations. Disabled equations are marked with a small box.

If a selected equation is already disabled, this command re-enables it.

This menu command allows you to use Mathcad's equation typesetting ability independently of its calculation features.

**Math ⇒ Automatic Mode**

Toggles between manual and automatic mode.

If checked, Mathcad automatically updates the screen whenever you make a change in the document.

If unchecked, Mathcad won't update the screen until you press **F9** to force recalculation.

When editing a document that involves lengthy calculations, you may find it more efficient to work in manual mode.

**Math ⇒ Numerical Format...**

Controls how a particular numerical result is displayed.

To change the way all numbers are displayed, click in an empty region, choose this, and click on Global in the dialog box.

You can control
- The number of decimal places displayed.
- How big or small a result must be before it's displayed in exponential form.
- How small a result must be before it's displayed as zero. (Global only)
- How small the real or imaginary part must be before it's suppressed.
- Whether Mathcad uses i or j for imaginary numbers. (Global only)
- Whether the number is hex, octal or decimal.
- Whether trailing zeros are used to indicate the precision of the number displayed.
- How large a matrix has to be before Mathcad shows it as a scrolling output table.

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*Mouse shortcut*          **Double-click on result**

**Math ⇒ Apply Font Tag...**

Displays a list of available font tags.

To tag a variable, click on it and choose the appropriate font tag from the list.

To see what font, size and style go with a given tag, choose **Modify Font Tag** from the **Math** menu.

**Math ⇒ Modify Font Tag...**

Displays a list of available font tags together with the font, size and style assigned to each one. You can use this dialog box to add additional font tags or change existing ones.

Note that if you change the font associated with an existing font tag, you change the font of every variable sharing that tag.

**Math ⇒ Change to Greek Variable**

Changes the letter behind the insertion point to a corresponding Greek letter.
▶ Type the appropriate roman letter from the table below.
▶ Choose this menu command.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| α | a | η | h | ο | o | ϖ | v |
| β | b | ι | i | π | p | ω | w |
| χ | c | φ | j | θ | q | ξ | x |
| δ | d | κ | k | ρ | r | ψ | y |
| ε | e | λ | l | σ | s | ζ | z |
| φ | f | μ | m | τ | t | | |
| γ | g | ν | n | υ | u | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Α | A | Η | H | Ο | O | ς | V |
| Β | B | Ι | I | Π | P | Ω | W |
| Χ | C | ϑ | J | Θ | Q | Ξ | X |
| Δ | D | Κ | K | Ρ | R | Ψ | Y |
| Ε | E | Λ | L | Σ | S | Ζ | Z |
| Φ | F | Μ | M | Τ | T | | |
| Γ | G | Ν | N | Υ | U | | |

*Keyboard shortcut*        **Ctrl+G**

**Graphics ⇒ Create X-Y Plot**

Creates a graph with either linear, log, or semilog axes. The plot will contain placeholders for x and y values as well as endpoints of the axes.

To change the axes, legends, plot style and other plot characteristics, choose **X-Y Plot Format** from this same menu.

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*Keyboard shortcut*          **@**

**Graphics ⇒ Create Polar Plot**

Creates a polar plot with placeholders for an angle variable and a radial expression.

To change the size and other plot characteristics, choose **Polar Plot Format** from this same menu.

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*Keyboard shortcut*          **Ctrl**+**7**

**Graphics ⇒ Create Surface Plot**

Creates a surface plot with a placeholder for an array to be plotted. The rows and columns will correspond to the x and y axes. The value in the array will represent the height above the xy plane.

To change the size and other plot characteristics, click on the plot and choose **Format** from the **Surface Plot** menu.

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*Keyboard shortcut*     **Ctrl+2**

**Graphics ⇒ Create Contour Plot**

Creates a contour plot with a placeholder for a matrix to be plotted. The rows and columns will correspond to the x and y axes. This provides a visual representation of the level curves of the matrix.

To change the size and other plot characteristics, choose **Contour Plot Format** from this same menu.

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*Keyboard shortcut*　　　**Ctrl**+**5**

**Graphics ⇒ X-Y Plot Format...**

Controls the characteristics of all graphs in the document. Use this to control:
- tick marks
- gridlines
- type of curve (bar, line, etc...)
- color of curve
- legends
- type of axis (linear or log)

**Graphics ⇒ Polar Plot Format...**

Controls the characteristics of the selected polar plot; click on the graph and choose this.

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*Mouse shortcut*          **Double-click on polar plot**

**X-Y Plot ⇒ Format...**
Controls the characteristics of the selected graph. Use this to control:
- tick marks
- gridlines
- type of curve (bar, line, etc...)
- color of curve
- legends
- type of axis (linear or log)

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*Mouse shortcut*      **Double-click on graph**

**X-Y Plot ⇒ Crosshair...**

Allows you to read coordinates directly from the selected graph.

**X-Y Plot ⇒ Zoom...**

       Allows you to zoom in on the selected graph for a close-up view.

**X-Y Plot ⇒ Title...**

Lets you specify a title above or below the graph.

**X-Y Plot ⇒ Axis Labels...**

Lets you specify a label below the x-axis, beside the y-axis, or both.

**Polar Plot ⇒ Format...**

        Controls the characteristics of the selected polar plot. Use this to control:
- tick marks
- gridlines
- type of curve (bar, line, etc...)
- color of curve
- legends
- type of radial axis (linear or log)

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*Mouse shortcut*        **Double-click on polar plot**

**Polar Plot ⇒ Crosshair...**

Allows you to read coordinates directly from the selected polar plot.

**Polar Plot ⇒ Zoom...**

Allows you to zoom in on the selected polar plot for a close-up view.

**Polar Plot ⇒ Title...**

Lets you specify a title above or below the polar plot.

**Contour Plot ⇒ Format...**

Controls the characteristics of the selected contour plot. Use this to control:
- presence of numbers on contours
- gridlines
- how many contours there are
- shading and color

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*Mouse shortcut*　　　　**Double-click on contour plot**

**Contour Plot ⇒ Title...**

Lets you specify a title above or below the contour plot.

**Surface Plot ⇒ Format...**

       Controls the characteristics of the selected surface plot. Use this to control:

- viewing angle
- vertical scale (how "bumpy" the plot is)
- hidden lines
- axes
- shading and color

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*Mouse shortcut*        **Double-click on surface plot**

**Surface Plot ⇒ Title...**

Lets you specify a title above or below the surface plot.

**Window ⇒ Cascade**

Hides inactive document windows behind the active window without obscuring any title bars.

**Window ⇒ Tile**

Arranges all document windows so that they:
- all have the same area
- completely cover the Mathcad window.

**Window ⇒ Arrange Icons**

When you close a document, an icon appears in the lower left corner of the application window. Choose this to arrange all these icons neatly.

**Window ⇒ Zoom...**

Zooms in for a close-up view by making this number larger than 100%.

To bring unseen portions of a document into view or to display an entire document, make this number smaller than 100%.

**Window ⇒ Refresh**

    Redraws the screen.

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*Keyboard shortcut*        **Ctrl+R**

**Window ⇒ Hide Palette**

Hides the symbol palette on the left of the Mathcad window. If the palette is already hidden, this command displays it.

**Window ⇒ Hide Tool Bar**

Hides the tool bar. If the tool bar is already hidden, this command displays it.

**Window ⇒ Hide Font Bar**

Hides the font bar. If the font bar is already hidden, this command displays it.

**Window ⇒ Change Colors ⇒ Background Color...**

Brings up a palette of colors for changing the background color of the application window.

**Window ⇒ Change Colors ⇒ Text Color...**

Brings up a palette of colors for changing the color in which Mathcad displays text.

**Window ⇒ Change Colors ⇒ Equation Color...**

Brings up a palette of colors for changing the color in which Mathcad displays equations.

**Window ⇒ Change Colors ⇒ Annotation Color...**

Brings up a palette of colors for changing the color in which Mathcad highlights any changes you've made to an Electronic Book.

**Help ⇒ Contents...**

        Provides help on menu commands and tells you how to start going through this demo.

*Keyboard shortcut*         **F1**

**Help ⇒ Keyboard...**

Opens a window containing help on all keystrokes.

**Help ⇒ Using Help...**

        Opens a window containing instructions for using the Mathcad Help system.

**Help ⇒ About the Mathcad Working Model**

Shows the version number of this demo.

**Help ⇒ What is Mathcad...**

Describes what Mathcad is and what kinds of things you can do with it.

**ERROR MESSAGES**

array size mismatch
cannot be defined
cannot take subscript
cannot take superscript
definition stack overflow
did not find solution
dimension to nonreal power
domain error
duplicate
end of file
equation too large
error in constant
error in list
error in solve block
file error
file not found
illegal array operation
illegal context
illegal factor
illegal function name
illegal ORIGIN
illegal range
illegal tolerance
incompatible units
indeterminate dimension
index out of bounds
invalid order
interrupted
list too long
misplaced comma
missing operand
missing operator
must be 3-vector
must be a multidimensional array
must be array
must be dimensionless
must be increasing
must be integer
must be nonzero
must be positive
must be range
must be real
must be scalar
must be square
must be vector
nested solve block
no matching Given
non-scalar value
not a name
not converging
not enough memory
only one array allowed

### *array size mismatch*

You tried to perform a vector or matrix operation on arrays whose sizes are inappropriate. For example, adding two unequal size matrices is illegal. Matrix multiplication requires that the number of columns in the first matrix match the number of rows in the second.

***cannot be defined***

Something other than a legally definable expression is on the left side of this definition. Mathcad accepts any of the following on the left side of a definition:

- A variable name.
- A variable name with a subscript.
- A variable name with a superscript.
- An explicit vector or matrix generated by typing **Ctrl**+**M**. The vector or matrix can hold variable names or subscripted variable names only.
- A function name with arguments: **f(x,y)**.

Any other expression is illegal. If you want to compute a result instead of defining a variable, use an equals sign **'='** instead of a colon.

***cannot take subscript***

You used a subscript on something other than a vector or a matrix.

***cannot take superscript***

You used a superscript on something other than a vector or a matrix.

***definition stack overflow***

This function definition contains too many nested functions.

### *did not find a solution*

In a solve block, Mathcad couldn't find a solution. Try raising the value of **TOL** or using the **minerr** function instead of the **find** function.

### *dimension to nonreal power*

This expression contains units that have been raised to a complex power. An expression with units can only be raised to a real power.

### *domain error*

You attempted to evaluate an operator or a function at an inappropriate value. For example, **In(0)** will give this error. So will **-3!** because factorial is undefined for negative numbers.

### *duplicate*

You tried to evaluate the same variable twice in the same definition. For example, if you create a vector on the left side of a **:=** and use the same name in more than one element, you will get this error.

### *equation too large*

This expression is too complicated for Mathcad to evaluate. Break the equation down into two or more smaller expressions.

### *error in constant*

This expression contains a digit or a decimal point followed by some letters. Mathcad tries to interpret anything beginning with a digit or a decimal point as a constant.

Sometimes this arises when you leave out the **\*** operator as you would when writing equations on paper. For example, writing **6x** instead of **6\*x** is often done on paper, but generates this error in Mathcad.

***error in list***

The indicated function definition contains an invalid list of arguments. A valid function definition begins like this:

functionname(argument list) := ...

The argument list must be a name or a list of names separated by commas. Any other expression is illegal.

You also see this error message if you create an invalid list in another context, for example, in the list of y-axis expressions for a plot.

### *error in solve block*

You see this error if you evaluate a user function that is defined in terms of a solve block with an error in it.

To fix the error, fix the problem in the solve block. If you evaluate the solve block directly, instead of defining a function with it, you will see a more specific error message.

***file error***

The file you are trying to access with **READ** or **READPRN** does not have the required format.

The file must be ASCII with spaces or tabs separating the numbers.

***file not found***

This expression refers to a file Mathcad was unable to find the file specified in the argument to **READ**, **READPRN**, **APPEND**, or **APPENDPRN**.

### *illegal array operation*

One of the functions or operators in this expression has received a vector or matrix when it was expecting a scalar.

For example, you see this message if you try to divide one vector by another.

If you want to apply a function or operator to every element in a vector or matrix, use the vectorize operator **Ctrl+-**.

### *illegal context*

The most common causes of this error message are:

- You entered a semicolon somewhere other than in a legal range definition. (The semicolon appears as two dots.)
- You used a **WRITE** or **APPEND** function anywhere other than on the left side of a definition. These functions should not be on the right side of a definition.
- You used an existing function name as a variable name or an existing variable name as a function name.
- You used a
- in a solve block.

### *illegal factor*

You entered an illegal expression in the placeholder at the end of a calculation equation. This placeholder requires real, non-zero, scalar values.

### *illegal function name*

You used an expression that Mathcad interprets as a function, but the function name is invalid. You see this error, for example, if you use a number as a function name: **6(x)**.

You may see this error if you omit an operator like *, causing Mathcad to interpret the parentheses in your equation as defining a function instead of as a way to group operations. This often happens because in algebra books, something like **3(x+2)** means **3x + 6**. In Mathcad, you must type **3*(x+2)**.

### illegal ORIGIN

You defined **ORIGIN** to be either non-integer, or an integer whose magnitude is greater than 16,000,000.

This error marks the first use of a subscript after the illegal definition of **ORIGIN**.

### *illegal range*

You defined a range variable with a range Mathcad could not interpret. When you define a range, you must use one of the following forms:

- **Rvar := n1 ..n2** (type Rvar:n1;n2)
- **Rvar := n1,n2 ..n3** (type Rvar:n1,n2;n3)

You can use at most one comma and one semicolon in the definition of a range for a range variable. If you use the second form, the value of **n2** must lie between the values of **n1** and **n3**, but not equal **n1**.

### *illegal TOL*

The built-in constant **TOL** is outside the allowable range.

To fix the error, define **TOL** with a value between 0 and 1 above the indicated expression.

***incompatible units***

This error message has three likely causes:
- You are adding or subtracting two terms having different dimensions.
- You have created a matrix, vector or table in which not all elements have the same dimensions.
- You have created a plot in which two expressions having different dimensions share the same axis.

### *indeterminate dimension*

You have raised an expression involving units to something other than a real power. Mathcad cannot determine the dimensions of the result. If an expression is defined with units, you can raise it only to a fixed real power.

### *index out of bounds*

This expression uses a subscript or superscript that refers to a nonexistent array element.

Keep in mind that unless you specify otherwise, all Mathcad arrays begin with 0th element. If you are used to thinking of arrays as beginning at the 1st element, reset **ORIGIN** to 1.

***invalid order***

Order is not one of the following numbers: 0,1,2...5.

***interrupted***

You interrupted a calculation pressing **Esc**.

To recalculate the marked equation, put the cursor in the equation and press **F9**.

### *list too long*

You entered too many elements in a list separated by commas. This can occur if you try to plot more expressions than Mathcad's capacity.

### *misplaced comma*

Commas can be used to separate:
- the arguments of a function,
- the first two elements of a range in the definition of a range variable,
- expressions in a plot,
- elements in an input table,
- subscripts in a matrix.

Any other use of commas is illegal in Mathcad expressions.

### missing operand

You have not filled in the indicated placeholders. You should place numbers or expressions in these placeholders.

### *missing operator*

This expression is missing an operator at the indicated location.

***must be 3-vector***

The vector cross product is defined only for vectors having three elements.

***must be a multidimensional array***

You performed an operation that requires a matrix. For example, when creating surface plots or contour plots, the array plotted must be a matrix, an array having at least two rows or two columns. Certain built-in functions also require matrix arguments.

### *must be array*

You performed an operation that requires an array on a scalar. For example, you see this error if you define a superscripted variable as a scalar. Since a superscripted variable represents a column of a matrix, you must define it as a vector.

For surface plots or contour plots, the array plotted must have at least two rows or two columns.

### *must be dimensionless*

This expression uses units somewhere units are not permitted.

Units are not permitted:
- in the arguments of most functions,
- in exponents,
- in subscripts and superscripts.

### *must be increasing*

The first argument of **lspline**, **pspline**, **cspline**, **linterp**, and **hist**, as well as the second argument of **interp**, must be a vector whose elements are strictly increasing.

Note that all vectors start at the 0th element unless you specifically set **ORIGIN** to 1. If you do not explicitly define the 0th element, Mathcad sets it to zero.

***must be integer***

This expression contains a non-integer expression where an integer is required.

Some possible places to look are:
- Superscripts and subscripts
- Arguments to certain functions such as identity, Bessel functions of integer order, **csort**, **rsort**, Kronecker delta, antisymmetric tensor function.

Note that although you can define range variables with fractional values, you cannot use these as subscripts or superscripts.

***must be nonzero***

This function is undefined at zero.

### *must be positive*

This plot has a logarithmic axis in which either the limits, or some of the values are not positive.

Negative numbers and zero cannot be placed anywhere on a logarithmic axis.

### *must be range*

This expression requires a range variable.

If the expression contains either a summation or an iterated product, check to see that the index is in fact a range variable. The index is directly under the sigma or pi. It should have been defined in an earlier statement.

### *must be real*

This expression contains an imaginary or complex valued expression somewhere in which it is not allowed.

Examples are subscripts and superscripts, arguments to Bessel functions, the Heaviside step function, **mod**, and **angle**.

### *must be scalar*

You used a vector or matrix expression where a scalar is required.

### *must be square*

This error marks a non-square matrix in an operation or function that requires a square matrix, such as determinants, inverse, raising to a power, or the **eigenvals** and **eigenvec** functions.

### *must be vector*

This error marks a matrix or scalar in an operation that requires a vector, for example, with the vector sum operator.

### nested solve block

You used two "**Given**"s in a row with no intervening **find** or **minerr**. Mathcad does not allow nested solve blocks.

You can however, define functions with solve blocks and use those function in other solve blocks.

### *no matching Given*

This error marks a **find** or **minerr** function with no matching **Given**. Each solve block that ends with **find** or **minerr** must begin with a region containing only the name **Given**.

### *non-scalar value*

You used a vector or ranged expression where a scalar is required.

For example, you see this message if **i** is a range variable and you try to enter an equation like **x := i**. You cannot define one range variable in terms of another.

### *not a name*

You used a number or other combination of symbols where Mathcad requires a name, for example, as the second argument of the root function.

### not converging

Mathcad was unable to compute an answer for an integral, derivative, **root**, **find**, or **minerr** function within the required tolerance. Try setting **TOL** to be larger, or try a different guess value.

### *not enough memory*

Mathcad was unable to compute an array or matrix because of insufficient memory. Try to free up some memory by making the array or matrix smaller or by deleting any large bitmaps, arrays, or matrices.

### *only one array allowed*

You entered more than one array in the placeholder of a contour plot. Mathcad will only accept one array at a time because contour plots can only represent a single surface at a time.

### *overflow*

You evaluated an expression that exceeds the largest number that Mathcad can represent.

### *significance lost* or *significance reduced*

These error messages indicate that you tried to evaluate a function for a value beyond the accurate range for the function.

For example, you see this message if you try to evaluate sin(10^100). Since the value of sin(10^100) depends on the ones digit of 10^100, any value that Mathcad could return would have no significant digits. Instead of returning a value of dubious accuracy, Mathcad shows one of these error message.

***singularity***

You evaluated a function or performed an operation at an illegal value. For example, you see this error if you divide by zero or if you try to invert a singular matrix.

### *stack overflow*

This expression overflows Mathcad's internal stack. Simplify the expression or divide it into two subexpressions.

### subscript too large

You tried to use a subscript or superscript that exceeds Mathcad's limit.

### *symbolic operator only*

You have tried to evaluate an expression numerically when it must be evaluated symbolically. When using operators such as the indefinite integral, you must select the expression and choose **Evaluate Symbolically** from the **Symbolic** menu.

### *too few arguments*

This expression contains a function with fewer than the required number of arguments.

For built-in functions, click on the function name and press **F1** to see the correct number and types of arguments. For functions you defined, check the definition.

### *too few constraints*

This error marks a **find** or **Given** with fewer constraints than variables to be solved. Add dummy constraints or decrease the number of variables to be solved for.

### too few elements

This error message marks a Fourier transform, cubic spline, or linear interpolation function applied to a vector with too few elements.

Splines and linear interpolation require vectors with at least two elements. Fourier transform functions and their inverses require at least four elements.

### *too few subscripts*

You used one subscript on a matrix. You must use two subscripts separated by a comma to specify a matrix element.

### *too large to compute*

Mathcad was unable to compute an array or matrix because of insufficient memory. Try to free up some memory by making the array or matrix smaller or by deleting any large bitmaps, arrays, or matrices.

### *too large to display*

You tried to display a vector or matrix bigger than Mathcad can display. Try breaking it down into pieces before displaying it.

### *too many arguments*

The indicated expression contains a function with more than the required number of arguments.

For built-in functions, click on the function name and press **F1** to see the correct number and types of arguments. For functions you defined, check the definition.

***too many constraints***

You included more than fifty constraints in a solve block.

***too many subscripts***

You used two or more subscripts on a vector.

### too many points

You tried to plot more points than Mathcad can handle in one plot.

***undefined*** (reverse video)

This variable or function is undefined. To define it, enter the variable or function name, followed by a colon (**:**) and an expression or number for its definition.

This error often means you have typed an equals sign (**=**) instead of a colon to define a variable. To define a variable, you must use a colon. The equals sign tells Mathcad to display a result.

You also see this message if you use a variable incorrectly in a global definition. If you use a variable on the right side of a global definition, the variable must be globally defined above the definition in which it is used. If you use a locally defined variable or a variable whose global definition is below the place where it is used, Mathcad marks the variable as undefined.

***NOTE:*** An undefined error is often an indication that another equation further up in the document is in error. If this is the case, all expressions that use the expression in error will be displayed in reverse video.

### *underflow*

You evaluated an expression smaller in magnitude than the smallest positive number that Mathcad can represent.

### unmatched parenthesis

This expression does not contain equal numbers of **(**'s and **)**'s.

### wrong size vector

This error marks a Fourier transform function whose argument has the wrong number of elements.
- **fft** requires a vector with 2^n elements.
- **ifft** requires an argument vector with 2^n+1 elements, where n is a whole number greater than 0.

Use **cfft** and **icfft** for arrays and vectors of any size.

*NOTE:* Unless you specify otherwise, all Mathcad arrays begin with 0th element. If you are used to thinking of arrays as beginning at the 1st element, reset **ORIGIN** to 1.

### *end of file*

You have asked Mathcad to read more data values from a datafile than there are values in the datafile. For example, if your datafile has ten numbers in it, and you type...

**i:1;100**

**x:READ(file)[j**

Mathcad places the ten numbers in the **x** vector and displays this message.

### *range not allowed*

Mathcad displays this message when you use a range variable in an inappropriate place, for example a solve block.

If you want to iterate with a solve block, try defining the function in terms of the solve block and using that function for iteration.