Chapter 4
Worksheet Management

This chapter describes how to manipulate and format Mathcad worksheets and templates, including how to save and print worksheets, send a worksheet by electronic mail, lock regions in a worksheet, and create file references and hyperlinks between worksheets. It also introduces Object Linking and Embedding (OLE) as a way of inserting other objects into a Mathcad worksheet and embedding Mathcad worksheets or regions into files created by other applications.

The following sections make up this chapter:

Worksheets and templates

How to use worksheets and templates. How to save worksheets in various formats.

Layout

How to adjust margins, insert page breaks, and create headers and footers.

Printing

How to print all or part of a worksheet. Includes a discussion of previewing your printed output.

Mailing

How to e-mail a Mathcad worksheet.

Safeguarding your calculations

How to write-protect selected areas of your worksheet.

References and hyperlinks

How to include a reference to a worksheet inside another worksheet. How to make Mathcad jump to another worksheet, open a pop-up window, or launch another application when you double-click on a region.

Using OLE

How to insert objects from other applications into a worksheet. How to embed a Mathcad worksheet or part of a worksheet into other applications.

Worksheets and templates

As you use Mathcad and save your work for later use, you usually are creating *worksheets,* each of which contains unique text, math, and graphic regions. You typically create a separate worksheet, or group of worksheets, for each of your different calculation procedures or projects. Mathcad uses "`.mcd`" as the default file extension for worksheets.

When you create a new worksheet in Mathcad, you can start with the equivalent of a blank piece of paper with Mathcad's default choices for formats and layout, or you can use a *template* that contains customized information for laying out and formatting the worksheet. When you create a worksheet based on a template, all of the formatting information and any text, math, and graphic regions from the template are copied to the new worksheet. The new worksheet therefore inherits the appearance and format-ting instructions of the template, allowing you to maintain consistency in the appearance of your work.

Mathcad comes with a variety of predefined templates for you to use as you create new Mathcad worksheets. You may extend the collection of templates by saving any of your Mathcad worksheets as a template. Mathcad uses "`.mct`" as the default file extension for templates.

Other saving options are available in Mathcad. You can save a worksheet in rich-text format (RTF), so that many word processors can open it. You can also save a worksheet in a format that can be read by Windows and Macintosh versions of Mathcad 6.

Creating and saving a new worksheet

When you open Mathcad, you'll see an empty window to work in—this is the *blank worksheet template*. You can enter and format equations, graphs, text, and graphics in this space, and you can modify worksheet attributes such as the page margins, numerical format, headers and footers, and text and math styles. When you want to save the worksheet, choose either **Save** or **Save As** from the **File** menu. The **Save As** dialog box appears, prompting you for a file name with the extension `.mcd` under which to save the worksheet. After the first time you save the worksheet, simply choosing **Save** from the **File** menu updates the saved copy of the worksheet.

The blank worksheet template is only one of the templates Mathcad provides. Other built-in templates are specific to types of worksheets you'll be creating. For example, there is a template for homework assignments, one for engineering reports, and so on.

To create a new worksheet based on a template other than the blank worksheet template:

■ Choose **New** from the **File** menu. You will see a dialog box like the one below (the exact templates available will differ depending on your version of Mathcad):
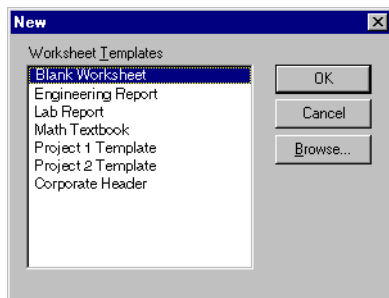
■ Choose a template other than "Blank Worksheet." By default Mathcad displays worksheet templates in the **template** subdirectory of whatever directory you used to install Mathcad. Click the "Browse" button to find a template in another directory or on another drive.

■ Click "OK."

■ Create and edit the necessary equations, text, and other regions for your worksheet.

■ Choose **Save** or **Save As** from the **File** menu. The **Save As** dialog box appears, prompting you for a filename with the extension **.mcd** under which to save the worksheet. After the first time you save the worksheet, simply choosing **Save** from the **File** menu updates the saved copy of the worksheet.

Creating a new template

Although Mathcad provides a variety of built-in templates, you can extend the collection of templates by creating your own. For example, you may want to use a template for a project that contains specific information in the worksheet header and footer, or you may want to customize the formatting in one of the predefined templates. The template you create can have equations, text, and graphics in certain places. The template also specifies:

■ Default text properties (Chapter 5).

■ Definitions of all math styles (Chapter 6).

■ Definitions of all text styles (Chapter 5).

■ Headers and footers (see "Layout" on page 84).

■ Margins for printing (see "Printing" on page 87).

■ Numerical result formats (Chapter 6).

■ Values for Mathcad's built-in variables (Chapter 8).

■ Names of Mathcad's basic units (Chapter 9).

■ The default unit system (Chapter 9).

■ The default calculation mode (Chapter 7).

To create a new template, first create a new worksheet having the options listed above set the way you want. The worksheet should also contain any equations, text, and graphics that you want in the template. The next step is to save this worksheet as a template. To do so:

■ Choose **Save As** from the **File** menu.

■ Double-click on the `Template` folder in the Save As dialog.

■ In the "Files of type" drop-down list, select "Mathcad Template."

■ Type a name for the template in the "File name" box.

■ Click "Save." The file is saved as a Mathcad template file (with the extension `.mct`) in the `template` subdirectory by default, but you may save it in another location if you wish.

Your template will now be added to the list of templates available in the dialog box that appears when you choose **New** from the **File** menu. To make a new worksheet based on a template you've created, simply choose **New** from the **File** menu and select your template from the list; if you did not save your template to the `template` subdirectory, you will need to browse to find the template.

Opening a worksheet

To work on a worksheet that you saved before, choose **Open** from the **File** menu. Mathcad prompts you for a name by displaying the Open dialog box. You can locate and open a Mathcad worksheet from other directories or drives just as you would in any other Windows application.

At the bottom of the **File** menu, Mathcad maintains a list of the most recently opened worksheets. You can bypass the Open dialog box by choosing from this list.

Opening a worksheet stored on the World Wide Web

If you are connected to the Internet and know the address of a Mathcad worksheet on a World Wide Web server, you can open it using the URL (Uniform Resource Locator) text box in the Collaboratory:

■ Choose **Collaboratory** from the **File** menu to open the Collaboratory dialog box.

■ Select the text that is in the URL text box at the bottom of the dialog box and press [`Del`] to delete it.

■ Type the URL of the worksheet you want to open in the URL text box. This identifies the name of the server computer on which the worksheet is saved together with the path to that worksheet within that computer's file system.

MathSoft maintains a collection of linked Mathcad worksheets on its World Wide Web server. To access these, choose **Resource Center** from the **Help** menu and click on "Web Library."

For more information about Internet access, the Collaboratory, and the Resource Center, see Chapter 2, "On-line Resources."

Editing a worksheet

Edit a worksheet by opening it by using **Open** from the **File** menu and then making any changes you choose. Then, to overwrite the original worksheet with the revised one, choose **Save**. Mathcad overwrites the original copy of the worksheet with the new copy that is currently shown in the worksheet window.

To make changes to an existing worksheet without modifying the original, choose **Save As** from the **File** menu instead. You will be prompted for a new name under which to save the worksheet.

Modifying a template

To modify an existing worksheet template,

■ Choose **Open** from the **File** menu.

■ In the "Files of type" drop-down list, select "Mathcad Template."

■ Type the name of the template in the "File name" box, or browse to locate it in the dialog box. Worksheet templates are saved by default in the **template** subdirectory.

■ Click "Open." The template opens in the Mathcad window.

You may now edit the template as you would modify any Mathcad worksheet. To save your changes under the current template name, choose **Save** from the **File** menu. If you wanted to give a new name to the modified template, choose **Save As** from the **File** menu instead and enter a new name for the template in the dialog box.

Note that when you modify a template, your changes will affect only new files created from the modified template. The changes will not affect any worksheets created with the template before the template was modified.

Saving your worksheet in RTF format

In addition to saving Mathcad worksheets and templates, Mathcad can save your entire worksheet in RTF format so that a word processor capable of reading an RTF file with embedded graphics might be able to open it. To do so:

■ Scroll to the bottom of your worksheet to update all calculated results.

■ Choose **Save As** from the **File** menu.

■ In the Save As dialog box, choose "Rich Text Format Files" from the "Save as type" drop-down list.

■ Enter a file name and then click "Save."

When you open this RTF file with a word processor such as Microsoft Word, you'll find all the Mathcad regions lined up one above the other at the left edge of the document. You can then use your word processor to move these regions wherever you want to.

Once the Mathcad regions saved in an RTF file have been loaded into a word processor, you'll no longer be able to edit equations and graphs—these will display as embedded graphics in your word processor. You will, however, still be able to edit the text.

To embed Mathcad worksheets or regions in a word processing document in a form that allows you to continue to edit the original Mathcad worksheets, see the section "Using OLE" on page 99.

Saving a worksheet as a Mathcad 6 file

In general, Mathcad worksheets are upwardly but not downwardly compatible. That is, worksheets created in an earlier version of Mathcad *will* open in the current version, but files created in the current version of Mathcad *will not* open in earlier versions. Mathcad 7, however, allows you to save a worksheet as a Mathcad 6 worksheet so that it will open in Mathcad version 6 for Windows or Macintosh. The caveat, of course, is that features in your worksheet new to Mathcad 7 will not be recognized in Mathcad 6. Regions or features that won't work in Mathcad 6 are not saved.

To save a worksheet as a Mathcad 6 worksheet:

■ Choose **Save** or **Save As** from the **File** menu.

■ In the "Save as type" drop-down list, select "Mathcad 6 Files" and provide a file name.

■ Click "Save." A message will appear warning you that certain features available only in Mathcad 7 will not work in Mathcad 6.

When you open a Mathcad 7 worksheet saved as a Mathcad 6 file in Mathcad 6 for Windows or Macintosh, you may see an additional warning indicating that certain features are not supported. For a list of product features, including features that are new in Mathcad 7, see "Mathcad features" on page 12.

Layout

Before printing a worksheet, you may need to adjust the margins, paper options, page breaks, and headers and footers so that pages of the worksheet are printed appropriately. This section describes how to change these worksheet attributes.

Once you've set these characteristics for a worksheet, you can easily apply these characteristics to future worksheets by saving your worksheet as a template, as described in the previous section.

Setting margins, paper size, source, and orientation

Mathcad worksheets have four user-specifiable margins, at the left, right, top, and bottom of the worksheet. To set these margins, choose **Page Setup** from the **File** menu. This brings up the Page Setup dialog box, shown below:
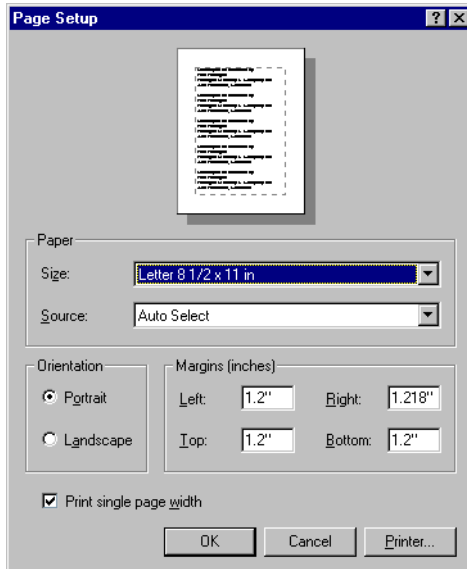
The four text boxes in the lower right of this dialog box show the distances from the margin to the corresponding edge of the actual sheet of paper on which you will be printing.

■ **Left:** This is the distance from the left edge of the physical sheet of paper to the left edge of the print area.

■ **Right:** This appears as a solid vertical line in your window. You may have to scroll to the right to see it. In addition to marking the right edge of the printed area, the right margin serves as a wrap margin for all text regions.

   Don't confuse the solid vertical line marking the right margin with the dashed vertical line marking the right page boundary. This line marks the right-hand edge of the sheet of paper itself. Its location depends on your choice of printer. If you haven't chosen a printer, you won't see this dashed line at all.

■ **Top:** This is the distance from the top edge of the physical sheet of paper to the top edge of the print area. If your worksheet has a header, it appears just above this margin.

■ **Bottom:** This is the distance from the bottom edge of the physical sheet of paper to the bottom edge of the print area. If your worksheet has a footer, it appears just below this margin.

You can also use settings in the Page Setup dialog box to change the size, source, or orientation of the paper on which you will print your worksheet:

■ **Paper, Size:** This should correspond to the size of the paper in your printer.

■ **Paper, Source:** This is the area in your printer supplying the paper.

- **Orientation, Portrait:** The paper is positioned vertically, with the longest dimension running from top to bottom.

- **Orientation, Landscape:** The paper is positioned horizontally, with the longest dimension running from left to right. This is useful if your worksheet is wider than a single page.

Click on the "Printer" button in the Page Setup dialog box to access your current printer settings. See "Printing" on page 87 for more about printing your Mathcad worksheets.

If you want the margin and other page setup settings in the current worksheet to be used in other worksheets, save the worksheet as a template as discussed in "Worksheets and templates" on page 80.

Pagebreaks

Mathcad provides two kinds of pagebreaks:

- **Soft pagebreaks**: Mathcad uses your default printer settings and your top and bottom margins to insert these pagebreaks automatically. These show up as dotted horizontal lines, and you see them as you scroll down in your worksheet. You cannot add or remove soft pagebreaks.

- **Hard pagebreaks**: You can insert a hard pagebreak by placing the cursor at the appropriate place in your worksheet and choosing **Page Break** from the **Insert** menu. Hard pagebreaks display as solid horizontal lines in your worksheets.

When Mathcad prints your worksheet, it begins printing on a new page whenever it encounters either a soft or a hard pagebreak.

To delete a hard pagebreak:

- Drag-select the hard pagebreak as you would select any other region in your Mathcad worksheet. A dashed selection box appears around the pagebreak.

- Choose **Cut** or **Delete** from the **Edit** menu.

Headers and Footers

To add a header or a footer to every printed page, choose **Headers/Footers** from the **Format** menu. This opens the Headers/Footers dialog box shown below:
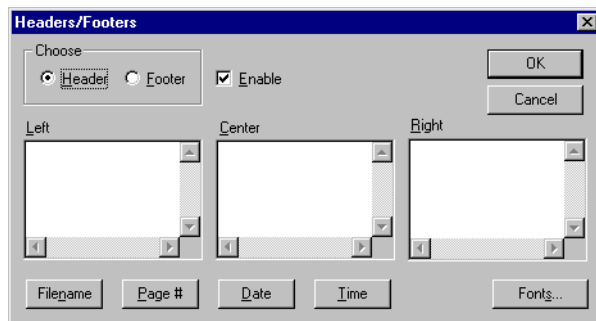
To add a header:

■ Click on the Header radio button.

■ Type the header into one or more of the text boxes. Whatever you type into the Left, Center, and Right text boxes will appear left-justified, centered, and right-justified on the page respectively.

■ To automatically insert the page number, current date, time, or filename wherever the insertion point is, click on the appropriate button below the text boxes. Mathcad inserts a special code into the text box. This will be replaced by the correct page number, date, time, or filename when you print the worksheet. Note that Mathcad always begins numbering at page 1.

■ Make sure the Enable check box is checked. When this is unchecked, Mathcad suppresses the display of headers and footers.

To add a footer:

■ Click on the Footer radio button.

■ Follow the rest of the instructions for inserting headers.

Printing

To print a Mathcad worksheet, choose **Print** from the **File** menu. The dialog box you see will depend on the particular printer you've selected. A typical dialog box is shown below:
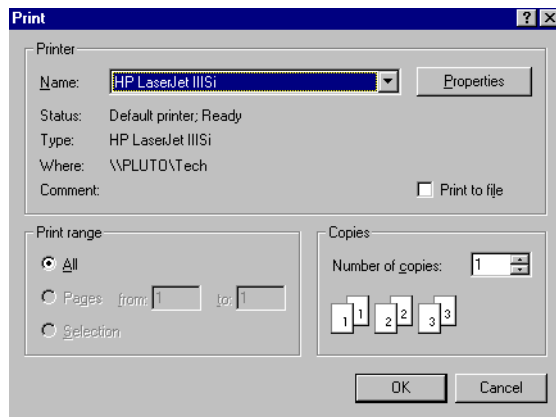
The Print dialog box lets you control whether to print the entire worksheet, selected pages, or selected regions; what printer to print on; and the number of copies to print. This section describes these various printing options in detail.

The "Properties" button in the Print dialog box gives you access to printing options for the paper, graphics, and fonts used by your printer. This allows you to change these options just before you print. If you don't want to print the worksheet immediately, you can change some of these options in the Page Setup dialog box as described in "Layout" on page 84.

Choosing what to print

You can choose to print the entire worksheet, selected pages, or even just selected regions. To control what Mathcad prints, click on one of the following radio buttons in the Print dialog box:

- **All:** Click this button to print all pages in the worksheet.

- **Pages:** Click this button to print a range of pages. Then fill in the two text boxes to indicate your selection. If you've selected a plotter as your output device, you'll only be able to print one page; the text box beside "To:" will be grayed out.

- **Selection:** Click this button to print only the currently selected regions. If the button is gray, you have not selected any regions with the dashed rectangle.

If you find more pages than you expect coming out of the printer, keep in mind that Mathcad worksheets may be *wider* than a sheet of paper as well as longer. See "Printing wide worksheets" below.

Choosing what to print on

By default, Mathcad sends its output to whatever printer you installed as a default printer under your operating system. The installed printer is shown in the "Name" drop-down list. You may send your output to any printer you have installed under your operating system; simply choose another printer from the "Name" drop-down list. To redirect your output to a file, click the "Print to File" checkbox.

Printing wide worksheets

Because Mathcad worksheets can be wider than a sheet of paper, the idea of a "page" is not as clear as it would be in, for example, a word processor. You can scroll as far to the right as you like in a Mathcad worksheet and place equations, text, and graphics wherever you like. As you scroll horizontally, however, you will see dashed vertical lines appearing to indicate the right margins of successive "pages" corresponding to the settings for your printer. The sections of the worksheet separated by the dashed vertical line will print on separate sheets of paper, yet the page number at the bottom of the Mathcad window does not change as you scroll to the right.

You can think of the worksheet as being divided into vertical strips as shown in Figure 4-1. Mathcad begins printing at the top of the left-most strip and continues until it reaches the last region in this strip. It then goes to the top of the adjacent strip and prints every page down to the last region in that strip. This procedure is repeated until everything in the worksheet has been printed. Note that certain layouts will produce one or more blank pages.
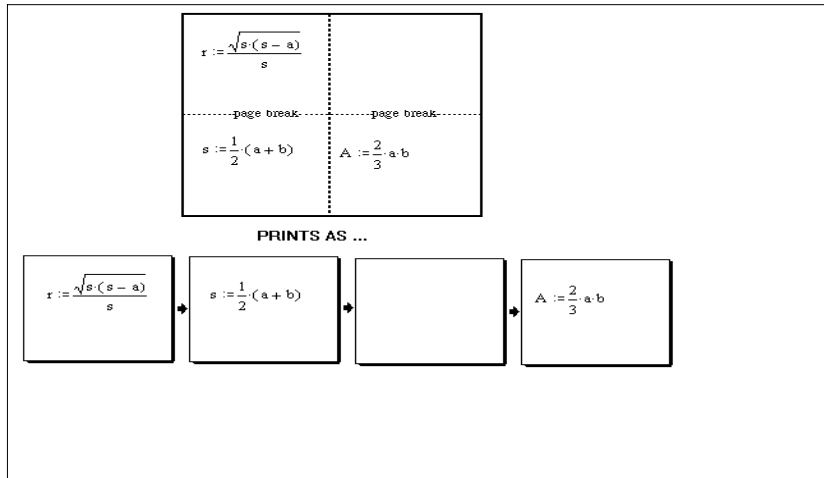
Figure 4-1: Mathcad divides very wide worksheets into strips for printing.

You can control whether or not Mathcad prints the entire worksheet or just the left-most strip shown in Figure 4-1. To do so, choose **Page Setup** from the **File** menu to open the Page Setup dialog box. Then:

■ To suppress printing of anything to the right of the right margin, click in the "Print single page width" box to put a check in it.

■ To print all the regions in the worksheet, even those to the right of the right margin, click in the "Print single page width" box to uncheck it.

As mentioned earlier in this section, you can ask Mathcad to print a range of pages in the worksheet by typing the page range in the Print dialog box. The page numbers in the dialog box refer only to horizontal divisions. For example, if your worksheet looks like that shown in Figure 4-1, and you ask Mathcad to print page 2, you will see two sheets of paper corresponding to the lower-left and lower-right quadrants in Figure 4-1.

To print only the lower left-hand page shown in Figure 4-1:

■ Choose **Print** from the **File** menu.

■ Type "2" in the boxes next to the words "From" and "To." This suppresses printing of the upper-left and upper-right quadrants.

■ Choose **Page Setup** from the **File** menu and make sure there is a check in the "Print single page width" box. This suppresses printing of the lower-right quadrant.

■ Click on "OK."

Note that this makes it impossible to print the upper- or lower-right quadrants by themselves.

Print preview

To check your worksheet's layout before printing, choose **Print Preview** from the **File** menu. The Print Preview window displays the current section of your worksheet, in miniature, as it will appear when printed. See Figure 4-2.
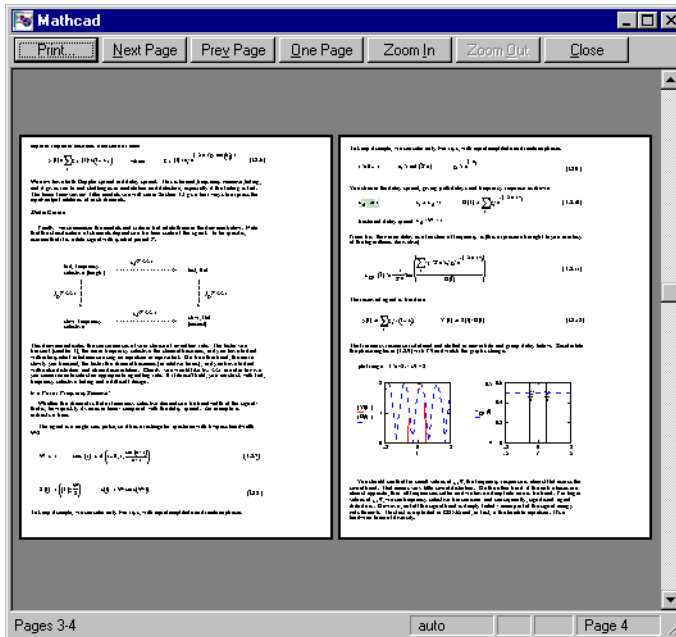

Figure 4-2: Previewing the printed output.

To print your worksheet from this screen, click on the "Print" button at the top of the window. Click "Close" to go back to the main worksheet screen. The remaining buttons at the top of the Print Preview screen give you more control over the preview:

■ **Next Page:** Click this button to preview the next page of the worksheet. If this button is gray, there are no further pages in the worksheet.

■ **Prev Page:** Click this button to preview the previous page of the worksheet. If this button is gray, there are no preceding pages in the worksheet.

■ **Zoom In:** Click this button to magnify a portion of the worksheet.

■ **Zoom Out:** Click this button to cancel any magnification so that you see your document in the normal size used in the Print Preview screen.

■ **Two Page or One Page:** Click "Two Page" to show two pages of the worksheet at a time, as was done in Figure 4-2. Click "One Page" to show only one.

Although you can use the "Zoom In" and "Zoom Out" buttons to magnify the worksheet, you can also magnify the worksheet by moving the cursor onto the

previewed page so that the cursor changes to a magnifying glass. Then click the mouse. You can click again to magnify your worksheet even more. Once you're at the maximum magnification, clicking on the page de-magnifies it.

You cannot edit the current page or change its format in the Print Preview screen. To edit the page or change its format, return to the normal worksheet view by clicking the "Close" button. You can then edit the worksheet or change its format as described in the previous section, "Layout."

Mailing

If you're connected to a mail system that's compatible with Microsoft Mail, you'll be able to use Mathcad to direct that system to send an electronic mail message and your current Mathcad worksheet. This saves you the work of opening a separate mail application to e-mail a Mathcad worksheet.

Mathcad supports any electronic mail system compatible with Microsoft's Mail API (MAPI). When you use Mathcad to send a worksheet by electronic mail, the recipient of the message will receive the worksheet as a file attached to an ordinary e-mail message, provided that the recipient's mail system uses the same encoding technique as yours.

To send a Mathcad worksheet by electronic mail:

■ Open the worksheet you want to send.

■ Choose **Send** from the **File** menu.

Once you do so, your mail system will launch and create a new message with your worksheet as an attachment. You should then enter the text of your mail message, the address of the recipient, and any other information allowed by your mail system.

The settings in your mail system determine how Mathcad worksheets are attached to the mail message. We recommend that you use an encoding method such as MIME or UUENCODE, if available, to attach Mathcad worksheets to mail messages.

If you're not connected to a MAPI-compatible mail system, the **Send** command on the **File** menu will be grayed out, but you can send a Mathcad worksheet by manually making it an attachment to a mail message.

Safeguarding your calculations

The ease with which you can alter a Mathcad worksheet can present a problem. It is all too easy to alter a worksheet and to change things which are not meant to be changed.

For example, if you've developed and thoroughly tested a set of equations, you may want to prevent anyone from tampering with them.

To avoid this, you may want to safeguard these equations by locking them up in such a way that you'll still be able to use them even though nobody will be able to change them.

Pro   You can use Mathcad Professional to lock a set of equations. To do so:

■ You designate a particular area in your worksheet as a lockable area.

■ You place the calculations that you want to safeguard into that lockable area.

■ You lock the area.

Once an equation is safely inside a locked area, nobody will be able to edit it. That equation will, however, continue to affect other equations in the document. For example, if you define a function inside a locked area, you'll still be able to use that function anywhere below and to the right of its definition. You will not, however, be able to change the function's definition itself.

The remainder of this section describes how to specify the beginning and the end of the lockable area as well as how to lock and unlock that area once you've created it.

Specifying the lockable area

A lockable area is designated by two lines as shown in Figure 4-3. The open padlocks above and below these lines indicate that the area is now unlocked. As long as this area remains unlocked, you can edit equations and text within it as freely as you would anywhere else in the worksheet.

To designate a lockable area:

■ Choose **Lock Regions**⇒**Set Lock Area** from the **Format** menu. Mathcad inserts a pair of lines like those in Figure 4-3. These mark the boundaries of the lockable area.

■ Select either of these boundary lines just as you'd select any region: by dragging the mouse across the line or by shift-clicking on the line itself.

■ Once you've selected the boundary line, drag it just as you'd drag any other region.

You should position the boundaries so that there's enough space between them for whatever equations you want to lock. You can have any number of lockable areas in your worksheet. The only restriction is that you cannot have one lockable area inside another.
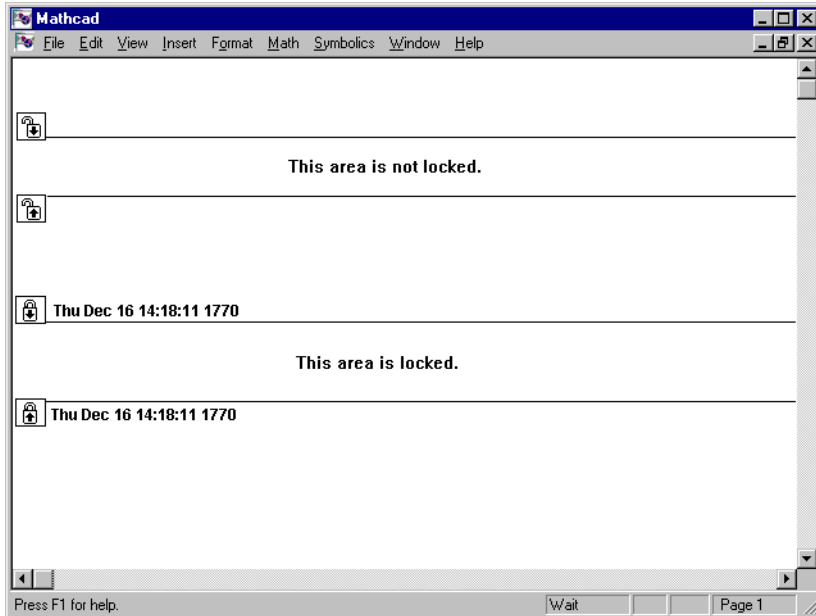
Figure 4-3: The area between the two lines is a lockable area. The first pair is still unlocked; the second pair was locked on the date shown.

Locking up the calculations

Once you've placed whatever equations you want to lock up inside the lockable area, you are ready to lock it up. You'll be able to lock it up either with or without a password. To do so:

■ Click in the lockable area.

■ Choose **Lock Regions⇒Lock Area** from the **Format** menu.

■ You'll see a dialog box asking you if you want to set a password. Click "Yes" if you want to require a password to unlock the area. Otherwise click "No."

■ If you clicked "Yes," you'll be prompted for a password. Type any combination of letters and numbers. Keep in mind that the password is case sensitive.

Once locked, the locked area looks like the lower pair of lines in Figure 4-3. The date and time the area was last locked is shown above and below the boundary lines.

Locking without a password is useful when you just want to prevent yourself from absent-mindedly changing something, and you don't want to worry about having to remember a password. When a region is locked without a password, anyone will be able to unlock it by simply choosing **Lock Regions⇒Unlock Area** from the **Format** menu.

Locking with a password is useful when you want to prevent unauthorized changes to a worksheet. When you choose this option, make sure you remember your password.

If you forget your password, you may find yourself permanently locked out of that lockable area.

Unlocking the calculations

If you want to make changes to an equation inside a locked area, you'll have to unlock it first. To do so:

■ Click on one of the boundary lines of the region you want to unlock. Mathcad highlights the boundary line.

■ Choose **Lock Regions**⇒**Unlock Area** from the **Format** menu.

■ If a password is required, you'll be prompted for the password.

Once an area is unlocked, you'll be able to make whatever changes you want to just as freely as you would anywhere else in your worksheet.

Deleting a lockable area

You can delete a lockable area just as you would any other region. To do so:

■ Make sure the area is unlocked. You cannot delete a locked area.

■ Select either of the two lines indicating the extent of the locked area by dragging the mouse across it.

■ Choose **Cut** from the **Edit** menu.

References and hyperlinks

Mathcad allows you to establish connections between Mathcad worksheets in two ways. One type of connection allows you to *reference* one worksheet from another—that is, to access the computational machinery in the other worksheet without opening it or typing its equations or definitions directly in the current worksheet. Mathcad also allows you to set up *hyperlinks* between Mathcad worksheets—that is, to create "hotspots" in your Mathcad worksheets that, when you double-click on them, bring up other Mathcad worksheets. You can also create simple hyperlinks in Mathcad worksheets in order to view arbitrary file types, such as word processing documents, help files, or animation files. These connections are explored in more detail below.

Pro Mathcad Professional also gives you MathSoft's MathConnex application to link Mathcad worksheets and other computational components to create heterogeneous computational systems. In MathConnex you draw "wires" between components, specifying which computational outputs from one component become the inputs for the next component. In this way you chain together computation procedures from Mathcad worksheets and other sources. See the *MathConnex Getting Start Guide* for more information. And for general information about establishing OLE links between Math-

cad and other applications, see the section "Using OLE" on page 99 and Chapter 19, "Data Management."

Making equations of one worksheet available in another

There may be times when you want to use formulas and calculations from one Mathcad worksheet inside another. You can, of course, simply open both worksheets and use **Copy** and **Paste** from the **Edit** menu to move whatever you need to move, or drag regions from one worksheet and drop them in the other. However, when entire worksheets are involved, this method may be cumbersome or may result in unnecessary clutter, obscuring the main computations of your worksheet.

A simple way to make formulas from one worksheet available in another one is to insert a *reference* in the current worksheet. When you insert a reference to a worksheet, you won't see the formulas of the referenced worksheet, but the current worksheet behaves *as if* you could.

To insert a reference to a worksheet:

■ Click the mouse wherever you want to insert the reference. Make sure you click in empty space and not in an existing region. The cursor should look like a crosshair.

■ Choose **Reference** from the **Insert** menu. You'll see the following dialog box:
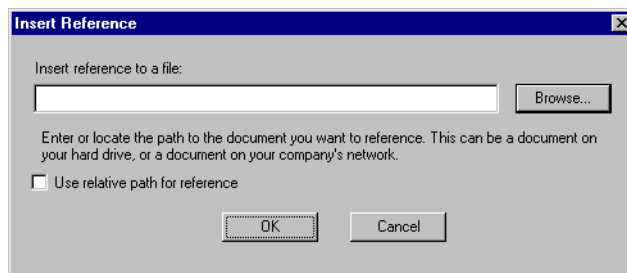
■ Click the "Browse" button to locate and select a worksheet. Alternatively, you may type the complete path to a worksheet in the empty text box. For example, you would type **c:\Program Files\MathSoft\Mathcad\conform.mcd** to insert a reference to the file **conform.mcd** located in the **Mathcad** folder. You can also enter an Internet address (URL) to insert a reference to a Mathcad file that is located on the World Wide Web.

■ Click "OK" to insert the reference into your worksheet.

To indicate that a reference has been inserted, Mathcad pastes a small icon wherever you had the crosshair as shown in Figure 4-4. The path to the referenced worksheet is to the right of the icon. All definitions in the referenced worksheet will be available below or to the right of this icon. If you double-click on this icon, Mathcad opens the referenced worksheet in its own window for editing. You can move or delete this icon just as you would any other Mathcad region.

By default, the location of the referenced file is stored in the worksheet as an absolute system path (or URL). This means that if you copy the main worksheet and the

referenced worksheet to a different file system with a different directory structure, Mathcad will not be able to locate the referenced file. If you want the location of the referenced file to be stored relative to the Mathcad worksheet containing the reference, however, click the "Use relative path for reference" box in the Insert Reference dialog box. This allows the reference to be valid even if you move the referenced file and the main worksheet, but keep the *relative* directory structure between the two the same. To use a relative path, the two worksheets must be on the same local or network drive. If you specify a relative path, Mathcad displays a capital "R" in parentheses at the end of the path for the reference in your worksheet.
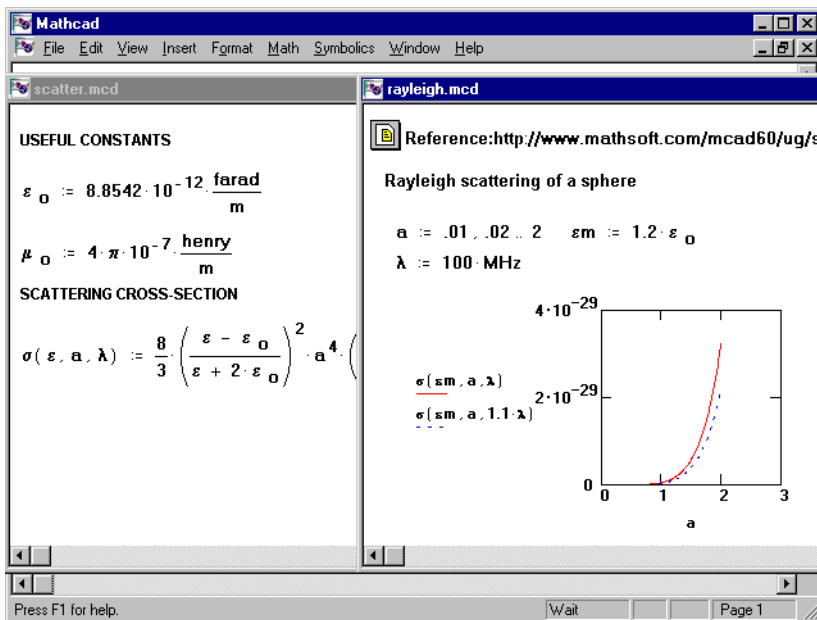

Figure 4-4: An icon representing a referenced worksheet, here from the World Wide Web. Definitions in the referenced worksheet are available below and to the right of this icon.

This mechanism will work for worksheets stored on a local or network drive or on the World Wide Web. Of course, if you move the referenced worksheet *after* having inserted a reference to it in another worksheet, Mathcad will display an error message in the main worksheet indicating that it can no longer find the referenced worksheet.

If you edit the contents of a referenced file so that any calculations change, you must re-open any worksheets that contain references to that file for any calculations to update. The calculations in those worksheets do not update automatically.

Creating hyperlinks between worksheets

You can create a hyperlink from any Mathcad region, such as a text region or a graphic element, to any Mathcad worksheet or template. When you or a reader double-clicks on this hyperlink, Mathcad will display the Mathcad worksheet designated by the hyperlink. In this way you can connect groups of related worksheets into a form similar

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to Mathcad's Electronic Books, or simply cross-reference a related Mathcad worksheet from within the current worksheet.

You have two options for the display of the linked worksheet when you double-click on the hyperlink:

■ The hyperlinked worksheet can open in a complete Mathcad worksheet window that overlays the current worksheet window and that allows you to edit its contents as you would any other worksheet, or

■ The hyperlinked worksheet can open in a small pop-up window that simply displays the contents of the worksheet, but does not allow you to edit its contents.

In either case the worksheet that contains the original hyperlink remains open for you to view and edit. Mathcad can follow a hyperlink to any worksheet, whether it is stored on a local drive, a network drive, or the World Wide Web.

To create a hyperlink, you must specify:

■ What to double-click on in order to go to another worksheet. This is the "gateway," and it can be a piece of text, an equation, or a graphics region.

■ What worksheet to go to. This is the "target worksheet."

First, specify the gateway by doing one of the following:

■ Select a piece of text, or

■ Click anywhere in an equation or graphics region, or

■ Place the insertion point anywhere within an entire text region.

The next step is to specify the target. To do so:

■ Choose **Hyperlink**⇒**New** from the **Insert** menu. You'll see the following dialog box:
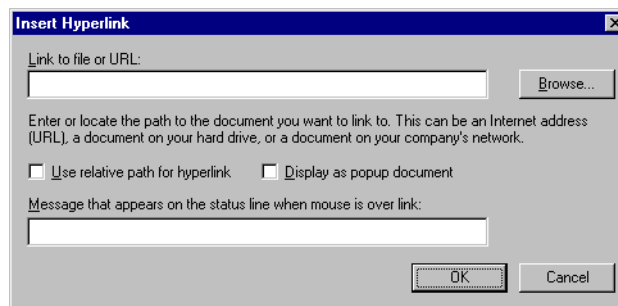
■ Click the "Browse" button to locate and select the target worksheet. Alternatively, you may type the complete path to a worksheet in the empty text box at the top of the dialog box. For example, type `c:\Program Files\MathSoft\Mathcad\conform.mcd` to insert a hyperlink to the file `conform.mcd` located in the `Mathcad` folder. You can also enter an Internet address (URL) to create a hyperlink to a file on the World Wide Web.

- Click the "Use relative path for hyperlink" box to store the location of the target worksheet relative to the Mathcad worksheet containing the hyperlink. This allows the hyperlink to be valid even if you move the target file and the worksheet containing the hyperlink, but keep the relative directory structure between the two the same. If you want the location of the target worksheet to be absolute instead, do not click the box for using a relative path. See the previous section, "Making equations of one worksheet available in another," for more information about relative and absolute paths.

- Click the "Display as pop-up document" checkbox if you want the target worksheet to open in a small pop-up window when you double-click on the gateway.

- If you want a message to appear on the status line at the bottom of the window when the mouse hovers over the gateway to the hyperlink, type the message in the text box at the bottom of the Insert Hyperlink dialog box.

- Click "OK."

Mathcad then establishes the hyperlink. If you used selected text as the gateway, Mathcad underlines the text and makes it bold to indicate the existence of a hyperlink. Other gateways won't be marked in any way, but if you use a graphic element as a "button" for the gateway, the existence of the hyperlink may be obvious. Mathcad will also now change the mouse pointer to a "hand" cursor when you hover over the gateway, and any message you specified will appear on the status line at the bottom of the window when the cursor is over the gateway.

When you double-click on the gateway to the hyperlink, Mathcad opens the target worksheet in the kind of window (either pop-up or full) you specified. You close a pop-up window by clicking on the close box in the upper right corner.

To change any aspects of a hyperlink—for example, if you move the target worksheet and still want the hyperlink to work—click anywhere in the gateway and choose **Hyperlink⇒Edit** from the **Insert** menu. Then you can change the name or location of the target worksheet, whether the target worksheet displays in a pop-up window, and whether the location of the target file is stored as a relative or absolute path. You can also change the status bar message assigned to the hyperlink.

To remove a hyperlink, simply click anywhere in the gateway and choose **Hyperlink⇒Erase** from the **Insert** menu. Mathcad will remove all traces of the link.

Creating hyperlinks to files other than Mathcad worksheets

The methods described in the previous section will create a hyperlink not only from one Mathcad worksheet to another, but also from a Mathcad worksheet to any other file type, either on a local or network drive or on the World Wide Web. Use this feature to create more full-featured "Electronic Books" or compound documents that contain not only Mathcad worksheets but word processing files, animation files—any file type that you want.

You can create a hyperlink to any file type for which you have an appropriate "viewer" application. When you double-click on a hyperlink to a file other than a Mathcad

worksheet, you launch either the application that created the file or an application that is associated with a file of that type in the Windows Registry. You do not have the option of displaying such hyperlinked files within a pop-up window in the Mathcad application frame.

For example, to create a hyperlink from a Mathcad worksheet to an animation (AVI) file:

■ Specify a gateway in your Mathcad worksheet as described in the previous section.

■ Choose **Hyperlink**⇒**New** from the **Insert** menu.

■ In the Insert Hyperlink dialog box, type the path or URL to the AVI file, or use the "browse" button to locate it on your file system.

■ If you want a message to appear on the status line at the bottom of the window when the mouse hovers over the gateway to the hyperlink, type the message in the text box at the bottom of the Insert Hyperlink dialog box.

■ Click "OK" when you are done.

Now when you double-click on the gateway, you will launch the Windows Media Player or a comparable application that can play AVI files, and you will see the animation.

Warning about hyperlinks from regions other than text

Although the gateway to a target worksheet can be any region, such as an equation or plot, there are two significant disadvantages to using a region other than selected text:

■ When you use text as a gateway, Mathcad makes the selected text bold and underlined to indicate that a hyperlink exists there. No corresponding indication is possible when you choose something other than selected text as a gateway.

■ The hyperlink preempts the normal response to double-clicking on the region. For example, if you choose a plot as a gateway, you will no longer be able to double-click on that plot to open a formatting dialog box.

For these reasons, we recommend that you use either selected text or an embedded graphic as a gateway to another worksheet.

Using OLE

As you develop a Mathcad worksheet, you may want to embellish it or extend its functionality by inserting *objects,* which are elements you create in another application such as a word processor or a drawing package. Conversely, you may want to insert Mathcad worksheets or regions from a Mathcad worksheet into another application. OLE (Object Linking and Embedding) technology in Microsoft Windows makes it possible not only to insert static pictures of such objects into your applications (or of

Mathcad objects into other applications), but to insert the objects in such a way that they can be fully edited in their originating applications.

You insert objects into Mathcad, which is an OLE2-compatible application, by using the **Object** command from the **Insert** menu, by drag-and-drop, or by copying and pasting. Each of these methods is explained in detail in this section. The method you choose depends on whether you want to create the object on the fly, whether the object has already been created, or whether you want the object to be an entire file. You can edit objects in a Mathcad worksheet simply by double-clicking on them, causing *in-place activation* of the originating application in most cases.

In general, you can also use these methods to insert Mathcad objects into other applications and edit them inside those applications. However, the details depend on the extent to which the application receiving a Mathcad object supports OLE2. This section, therefore, focuses on inserting objects into Mathcad and only briefly touches on inserting Mathcad objects into other OLE2-compatible applications.

For information about using Mathcad's components for importing and exporting data, as well as establishing dynamic connections with other applications, see Chapter 19, "Data Management." If you would like to import or export graphic files such as bitmaps into your Mathcad worksheets, turn to Chapter 28, "Importing and Exporting Graphics."

Embedded vs. linked objects

Objects can be either *embedded* in or *linked* to a Mathcad worksheet. For you to link an object, the object must exist in a saved file. An object that you embed, on the other hand, may be created at the time of insertion or it may be part of a saved file. The difference between an embedded object and a linked object is only important when you want to edit it. When you edit an embedded object, any changes you make to the object will affect it only in the context of the Mathcad worksheet. The original object in the source application, if there is one, is left undisturbed. When you edit a linked object, on the other hand, any changes you make to the object will affect the actual file containing the object.

Inserting an object into a worksheet

One way to insert an object from another application into Mathcad is to use the **Object** command from the **Insert** menu. Using this method, you can insert an object that you create on the fly at the time you are inserting it, or you can insert an entire file that you've already created.

To insert an object or a saved file, you should first:

■ Click in a blank area of your worksheet where you would like to insert the object. Make sure that you see the crosshair.

■ Choose **Object** from the **Insert** menu to bring up the Insert Object dialog box. By default the "Create New" radio button is selected:
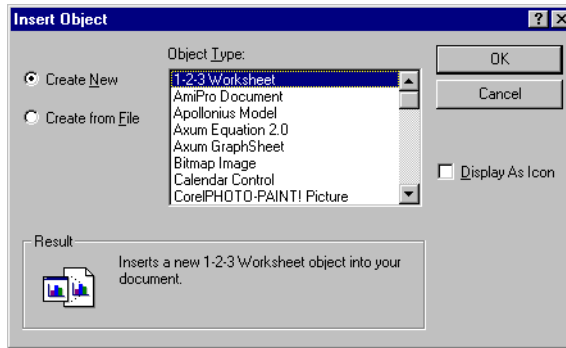
■ Click the "Display as Icon" checkbox if you want an icon, rather than the actual object, to appear in your worksheet. The icon is typically the icon of the application that created the object.

Then, to create a new object:

■ Select an application from the "Object Type" list in which to create the object. The available object types will depend on the applications you have installed on your system.

■ Click "OK."

The source application opens so that you can create the object. When you are finished working to create the object, close the source application. The object you created will be embedded in your Mathcad worksheet.

If you want to insert a previously created file:

■ Click the "Create from File" radio button in the Insert Object dialog box. The dialog box will then look like this:
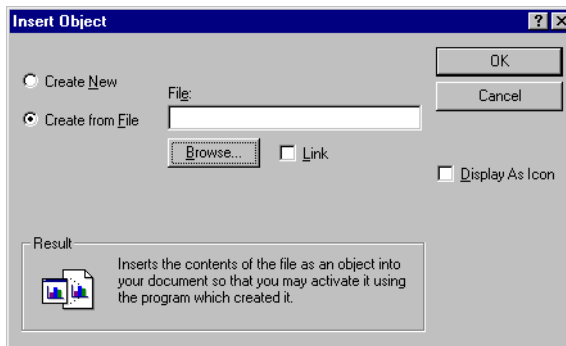
■ Type the path to the object file or use the "Browse" button to locate it.

■ Click the "Link" checkbox to insert a linked object. Otherwise, the object will be embedded.

■ Click "OK."

The object will then be either linked or embedded in your Mathcad worksheet.

Pasting an object into a worksheet

Instead of inserting an object through the Insert Object dialog box, you can copy an object from a source application to the clipboard and paste it into Mathcad. This method is particularly useful when you've already created the object in another application and you don't want to insert an entire file.

To insert an embedded or linked object into a worksheet via the clipboard:

■ Open the source application containing the object.

■ Copy the object to the clipboard in the source application. You typically do this by choosing **Copy** from the **Edit** menu, or by pressing [**Ctrl**]**C**.

■ Click in the Mathcad worksheet where you'd like to place the object.

■ Choose **Paste** or **Paste Special** from Mathcad's **Edit** menu.

If you choose **Paste**, the object will be pasted in your Mathcad worksheet in a format that depends on what the source application has placed on the clipboard. The behavior may differ depending on whether you have selected a math placeholder or are pasting into a blank space in the worksheet. Mathcad will create one of the following:

■ A *matrix,* if you are pasting numeric data from the clipboard into an empty math placeholder. (See Chapter 19, "Data Management.")

■ A *text region,* if you are pasting text that does not contain numeric data exclusively.

■ A *bitmap* or *picture (metafile),* if the originating application generates graphics. (See Chapter 28, "Importing and Exporting Graphics.")

■ An embedded object, if the originating application supports OLE.

If you choose **Paste Special** from the **Edit** menu, you have the option of pasting the object in one of the available formats, which depend on the object you've copied. Typically you can choose to paste the object as an embedded or linked OLE object (if the object was stored in a saved file in an OLE-compatible source application), a picture (metafile), or a bitmap.

Dragging and dropping an object into a worksheet

A third way to insert an OLE object into a Mathcad worksheet is to drag it from the source application and drop it into the worksheet. This is very similar to copying and pasting, but does not allow you to create a link to an object. To do so:

■ Open both Mathcad and the source application and arrange the two windows side by side on the screen.

■ Select the object in the source application, usually by drag-selecting.

- Hold the mouse button down. For some applications, it may be necessary to press the [**Ctrl**] key and hold the mouse button down to ensure that the object will be copied (rather than cut) from the source application.

- Drag the cursor onto a blank space in the Mathcad worksheet.

- Let go of the mouse button to drop the object into the worksheet.

Editing an object

To edit either an embedded or linked object in a Mathcad worksheet, double-click the object. Mathcad's menus and toolbars will change to those of the source application, and a hatched border will surround the object so that you can edit it. This OLE editing mechanism is called in-place activation. For example, you can use in-place activation to edit objects created by Microsoft Office 95 or 97 applications such as Excel and Word inside Mathcad.

If the source application does not support in-place activation inside Mathcad, the behavior will differ. In the case of an embedded object, a copy of the object is placed into a window from the other application. If the object is linked, the source application opens the file containing the object.

Editing a link

If you've inserted a linked object into a Mathcad worksheet, you can update the link, eliminate it, or change the source file to which the object is linked. To do so, choose **Links** from the **Edit** menu. You'll see the following dialog box:
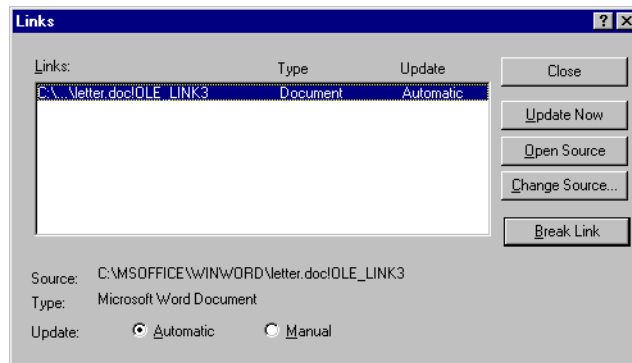
Choose the link you want to edit from the list of links. Then make any of the following changes:

Automatic: Click this radio button to make the link update whenever you open the worksheet and any time the source information changes while the worksheet is open.

Manual: Click this radio button to make the link update only when you press the "Update Now" button.

Update Now: Click this button to update a manual link.

Open Source: Opens the application in which the linked object was created.

Change Source: Links the object with a different source file. The new source file must have been created in the same application as the original source file.

Break Link: Breaks the link between an object's original source and the copy of the object in the worksheet.

Inserting Mathcad objects into other applications

Just as you can insert objects into a Mathcad worksheet from other OLE2-compatible applications, you can insert Mathcad objects—either entire Mathcad worksheets or selected Mathcad regions—into other applications. The methods of doing so are nearly the same as those outlined in the previous section for inserting objects into Mathcad. They depend, however, on the extent to which the other applications support OLE2.

For example, you may use any of the three methods of inserting OLE objects (choosing **Object** from the receiving application's **Insert** menu, copying and pasting, and drag-and-drop) to insert Mathcad objects into Microsoft Office 95 or 97 applications.

Once you've inserted a Mathcad object into another application, you can edit it by double-clicking on it. If the application supports in-place activation, as Microsoft Office applications do, the menus and toolbars will change to Mathcad's so that you can edit the object without exiting the application and launching Mathcad. Figure 4-5 shows the in-place activation of a Mathcad object inside Microsoft Word.
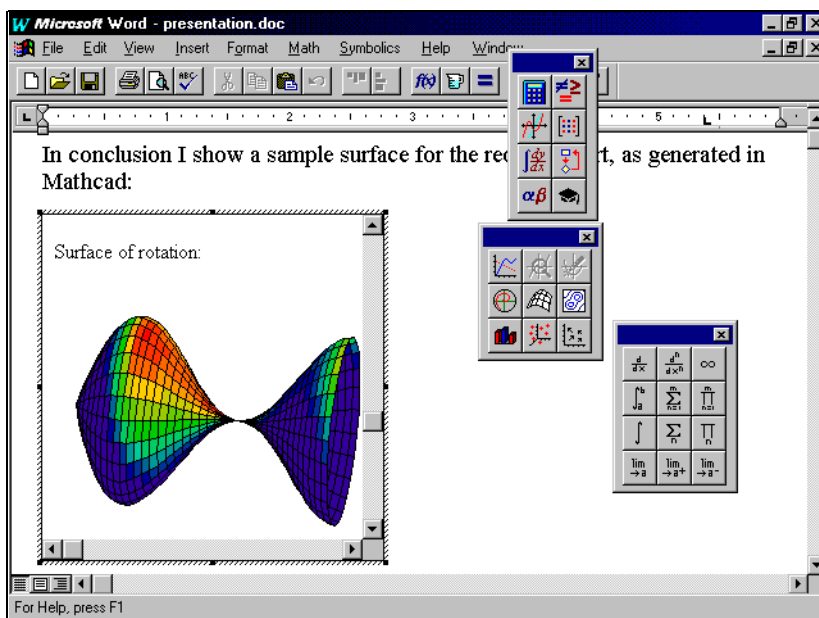

Figure 4-5: In-place activation of a Mathcad object inside Microsoft Word, giving you access to Mathcad's menus, toolbar, and palettes.