

Putting equations into a Microsoft Word 2003 document

This Guide describes how to use the Equation Editor within Word to create equations. Familiarity with the basic editing operations in Word is assumed. There is a brief discussion of other ways of putting equations into a document.

$$x_{\pm} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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Conventions:

In this document, the following conventions are used:

- A typewriter font is used for what you see on the screen.
- A **bold typewriter font** is used to represent the actual characters you type at the keyboard.
- A *slanted typewriter font* is used for items such as filenames which you should replace with particular instances.
- A **bold font** is used to indicate named keys on the keyboard, for example, **Esc** and **Enter**, represent the keys marked Esc and Enter, respectively.
- A **bold font** is also used where a technical term or command name is used in the text.
- Where two keys are separated by a forward slash (as in **Ctrl/B**, for example), press and hold down the first key (**Ctrl**), tap the second (**B**), and then release the first key.

Contents

1	Introduction	1
1.1	L ^A T _E X (or T _E X)	1
1.2	MathType	3
1.3	Maple to Word.....	3
2	Configuring Word	4
3	Starting the Equation Editor	5
4	The Toolbar	6
5	Building the equation	7
6	Inserting the equation into your document	10
6.1	Editing an inserted equation	10
6.2	Resizing an equation	10
7	More on building an equation	11
7.1	Enlarging the Equation Editor	11
7.2	Equation order	11
7.3	Moving around an equation	11
7.4	Selecting equation items.....	12
7.5	Deleting equation items	12
7.6	Entering text in an equation	12
8	Alignment and spacing	13
8.1	Redrawing an equation	13
8.2	Aligning a pile of equations	13
8.3	Numbering equations.....	14
9	Shortcut keys	14

1 Introduction

Several ways of putting equations into a document are described in this Guide. You should make sure that you use the method that is most appropriate for your situation.

If you are about to produce a document, such as a scientific thesis, containing a large number of equations to be typeset to a high standard, you should consider using

- \LaTeX — see section 1.1
- MathType with Word — see section 1.2

If you want to produce a Word document with just a few equations in it, and do not wish to use MathType, there are several ways to proceed:

- Anyone who is already a competent user of \TeX or \LaTeX could use that software to create an equation and then put it into their Word document — see section 1.1.
- If you are familiar with the symbolic mathematics package Maple, you could consider using that to display your equations before importing them into Word — see section 1.3.
- The Equation Editor provided with Word could be used — see section 2 onwards.

You may like to consult your department for guidance.

The following equations will be used to compare the results of the various approaches. They are produced here using the Equation Editor:

$$\left(\int_{-\infty}^{\infty} e^{-x^2} dx\right)^2 = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} e^{-(x^2+y^2)} dx dy$$

$$I = \int_{-\infty}^{\infty} \left(\frac{x^2 - \frac{3}{a}}{x^4 + 4} \right) e^{-x^2} dx$$

1.1 \LaTeX (or \TeX)

\LaTeX and \TeX are typesetting tools that are widely used for producing scientific documents. To get more information about this software:

Use a browser to access <http://www.dur.ac.uk/its/software>

- 2 In the box under **Search**, enter **latex**
- 3 Click the **Search** button.
- 4 Click on **latex**.

- 5 Under **Further information**: follow the link to **ITS pages relevant to latex**.

If you already have a file such as **myeqns.tex** (containing text and equations) it is possible to put one or more of the equations into a Word document should you wish to do so. The procedure is outlined below.

The first step is to produce picture files of your equations.

- 1 At a UNIX prompt, type

setenv DENSITY 300

This will give you a higher resolution than the default and produce a better quality picture of your equation. You can choose a setting other than 300 dots per inch if you wish.

- 2 Then type

latex2html myeqns.tex

A directory called **myeqns** will be created containing a **myeqns.htm** file and lots of **.gif** files (one for each equation — **img1.gif, img2.gif, ...**).

- 3 If you are using a stand-alone PC, copy these **gif** files from UNIX to your PC.
- 4 In your Word document, position the cursor where an equation is to be inserted.
- 5 Select **Insert | Picture | From File**.
- 6 In the **Insert Picture** dialog box, navigate to where your **gif** files are stored.

If you select a **gif** file you will see a preview of the picture. This will help you to locate the correct equation.

- 7 Select the picture you want and click the **Insert** button.

The picture of your equation as it appears in your document may well be larger than you require. In that case, click on the picture to select it and drag a corner to re-size the equation. If it appears to be somewhat faint, don't worry, it should print all right.

Here are a couple of examples; you can compare them with the equations produced using the Equation Editor in the Introduction (section 1).

$$\left(\int_{-\infty}^{\infty} e^{-x^2} dx \right)^2 = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} e^{-(x^2+y^2)} dx dy$$
$$I = \int_{-\infty}^{\infty} \left(\frac{x^2 - \frac{3}{a}}{x^4 + 4} \right) e^{-x^2} dx$$

Note: If you want to re-run **latex2html** with the same T_EX file you should first remove all the files it produced the last time.

If you would like more information about latex2html, see *InfoSheet 130: Using latex2html*.

1.2 MathType

MathType is a mathematical equation editor for personal computers. It can generate high-quality mathematical notation for a variety of purposes including word processing and presentations.

It is very easy to use and has many more symbols and templates than the Equation Editor. MathType automatically re-sizes square root signs and parentheses to fit their contents, inserts suitably-sized spaces around operators and relational symbols, and displays standard abbreviations in an appropriate style.

MathType has been installed on the ITS Networked PC service. *Guide 143: Using MathType* is available from the IT Service Desk and the ITS Web pages.

The sample equations are produced here using MathType:

$$\left(\int_{-\infty}^{\infty} e^{-x^2} dx \right)^2 = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} e^{-(x^2+y^2)} dx dy$$

$$I = \int_{-\infty}^{\infty} \left(\frac{x^2 - \frac{3}{a}}{x^4 + 4} \right) e^{-x^2} dx$$

1.3 Maple to Word

If you use the symbolic mathematics package Maple, you can use that to display mathematical expressions and then import them into Word.

For single expressions, the easiest way to do this is to cut and paste each expression from Maple into Word:

- 1 Run **Maple** on a PC.
- 2 Display the expression in Maple.
- 3 Highlight the whole expression using the mouse.
- 4 From the **Edit** menu, select **Copy**.
- 5 In Word, position the cursor where the expression should be inserted.
- 6 Paste the expression directly into your text.

Here are the two examples:

$$\left(\int_{-\infty}^{\infty} e^{(-x^2)} dx \right)^2 = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} e^{(-x^2-y^2)} dx dy$$
$$I = \int_{-\infty}^{\infty} \frac{\left(x^2 - \frac{3}{a}\right) e^{(-x^2)}}{x^4 + 4} dx$$

For larger blocks of mathematical expressions, export an entire Maple worksheet in Rich Text Format (RTF).

From within Maple:

- 1 From the **File** menu, select **Export As** and choose **RTF**.
- 2 Enter a name for the RTF file and save it.

Then, in your Word document:

- 3 Position the cursor where the equations should be inserted.
- 4 From the **Insert** menu, select **File**....
- 5 Set the file type to **RTF** and navigate to the directory where you saved the RTF file.
- 6 Select the RTF file and click on the **OK** button.

The Maple command lines will be included in the RTF file. Once you have inserted the file into Word, these lines can be removed one by one if you do not want to include them. The display-maths expressions should look exactly like the ones shown above.

There is more information about Maple in ITS [Guide 65: Basic Maple](#).

2 Configuring Word

The rest of this document is about using the Equation Editor in Word.

Before you start working through the various sections, you should check a couple of settings in Word.

- 1 Activate Word (if you have not already done so).
- 2 Select **Tools | Options**.
- 3 Click on the **View** tab.
- 4 Make sure that the boxes next to **Picture placeholders** and **Field codes** are both clear. (If there is a tick, click on it.)

- 5 Click on **OK**.

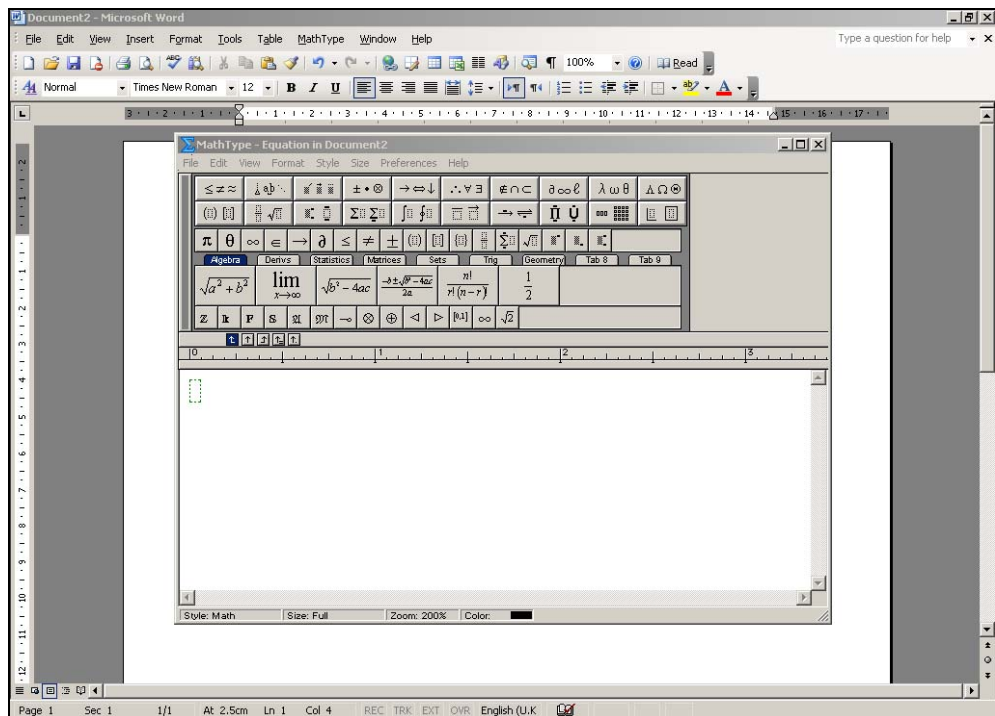
3 Starting the Equation Editor

As an example, instructions will be given for creating the following equation:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The first step is to open the Equation Editor, making sure that the insertion point is at the position in your document where you want the equation to appear.

- 1 Open a new document — if you do not already have one on the screen.
- 2 Select **Insert | Object...** from the menu bar.
- 3 Make sure that the **Create New** tab is selected.
- 4 In the **Object type:** window, select **Microsoft Equation 3.0**.
- 5 Click on **OK**.



Important: In Word 2003 on NPCS, this actually starts up the complete MathType package. For further details about this, please see ITS Guide 143: Using Mathtype.

Note: The following text refers more to earlier versions of Word, and PCs which do not have MathType installed on them, but almost all of the principles are the same in Word 2003 on NPCS.

Take care not to click outside the highlighted box — i.e. within the document. This will close the Equation Editor and return you to the document with the equation inserted — or a blank area if you have not yet created any equation. If you do this by accident, either click on the equation and then choose the command **Edit | Equation Object | Edit**, or simply double-click on the equation.

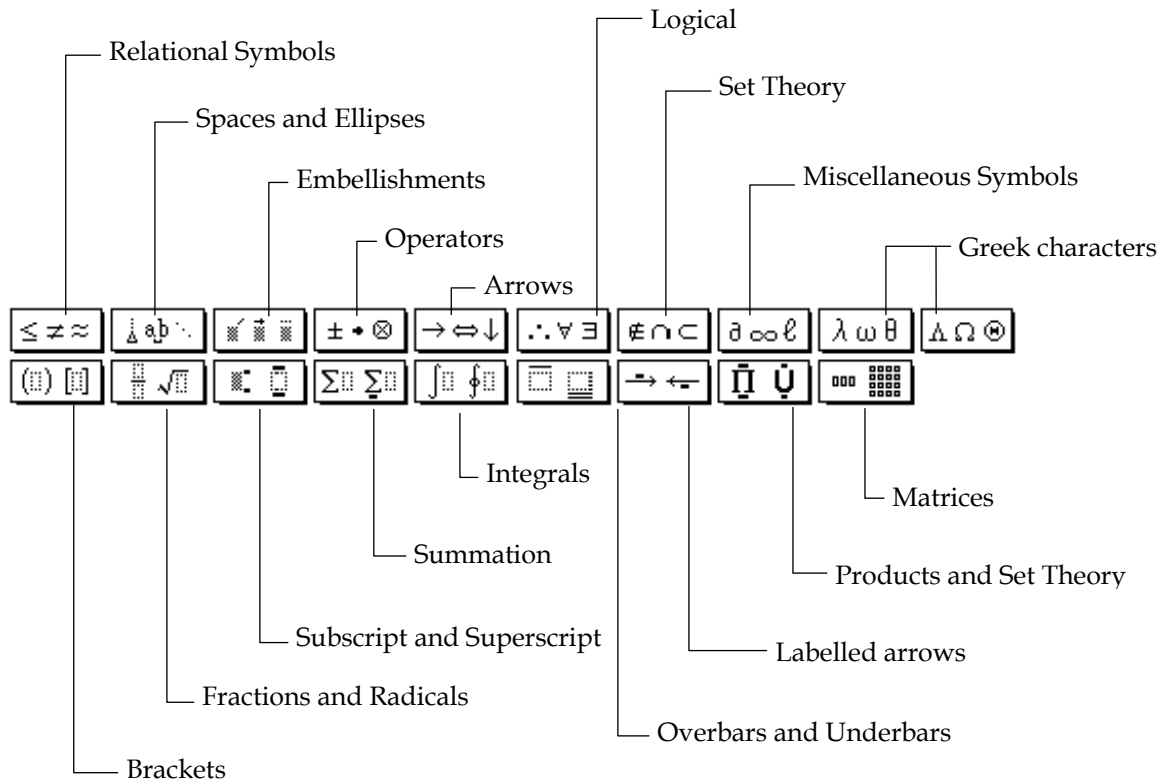
4 The Toolbar

Each button on the Toolbar opens up a menu of items to select.

The buttons on the top row are *Symbols* — groups of related mathematical symbols such as operators and Greek letters.

The buttons on the bottom row are the *Templates*. A template is a formatted collection of symbols and empty slots.

Equations and expressions are created by inserting templates and then filling in their slots with numbers, letters or symbols.



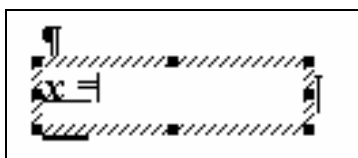
5 Building the equation

The small dotted box with the flashing insertion point is an empty slot, where you will begin to build the equation.

- 1 Type

$x=$

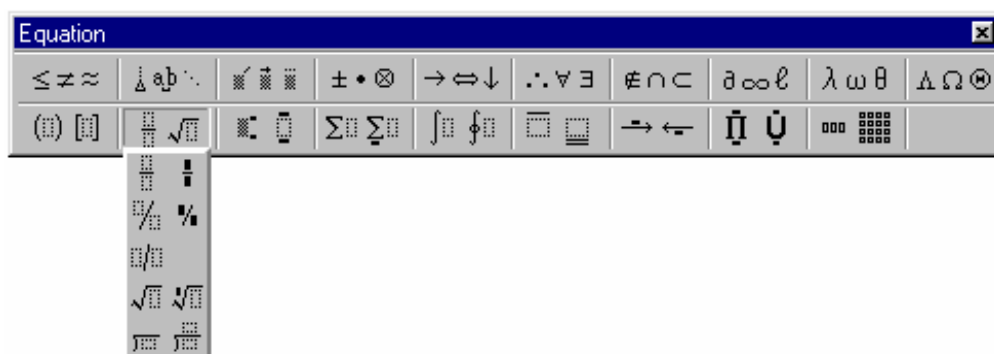
Do not put a space in-between — the editor will take care of that.



It is possible to build the equation in any order. For this example insert the fraction (the horizontal line) next.

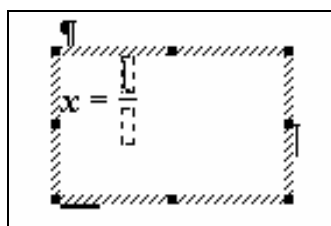
- 2 Click on the **Fraction and radical templates** button.

A menu of options appears.



- 3 Click on the full-size vertical fraction template (top left).

The equation now looks like this.

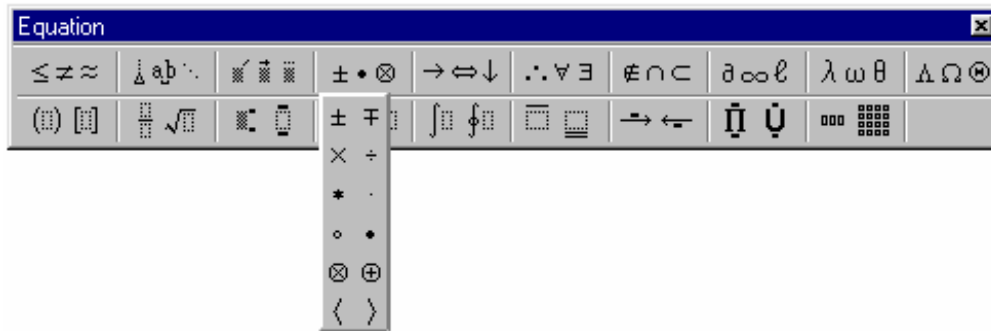


The insertion point is in the upper slot of the fraction. You can now build this part of the equation.

- 4 Type (with no spaces)

$-b$

5 Click on the **Operator symbols** button (top row, fourth from left).



6 Click on the plus or minus symbol, ±, (top left).

The symbol is inserted into the equation.

$$x = \frac{-b \pm []}{[]}$$

The next step is to insert the square root symbol.

7 Click on the **Fraction and radical** button.

8 Click on the square root template.

The equation now looks like this

$$x = \frac{-b \pm \sqrt{[]}}{[]}$$

Now insert the next part of the equation.

9 Type

b

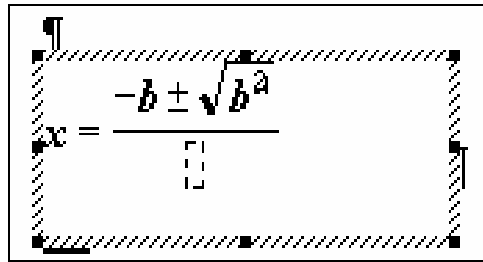
The next step is to insert the superscript of **b²**.

10 Click on the **Subscript and superscript templates** button (bottom row, third from left).

11 Click on the single superscript template (top left).

12 Type

2



The screenshot shows a Microsoft Word window with a hatched border. Inside, the quadratic formula is being typed: $x = \frac{-b \pm \sqrt{b^2}}{}$. The insertion point is positioned after the superscript '2' in the numerator, indicating the next step is to add $-4ac$ to the term under the square root.

The next step is to add $-4ac$ to the upper fraction. Notice that the insertion point is still positioned after the superscript **2**. If you typed in $-4ac$ now, it would appear as part of the superscript like this: b^{2-4ac} . This is incorrect for the equation you want.

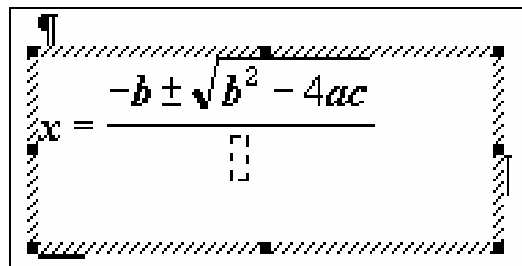
The insertion point must be moved out of the superscript first.

13 Press the **Tab** key.

Notice that the insertion point is now larger.

14 Type

-4ac



The screenshot shows the same Microsoft Word window. The quadratic formula is now $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{}$. The insertion point has moved from the superscript to the empty slot in the denominator, indicating the next step is to type '2a'.

The upper part of the equation is now complete.

To complete the lower part of the fraction, you must position the insertion point in the empty slot under the line.

15 Click in the empty slot or use the arrow keys to position the insertion point (make sure that it is within the slot).

16 Type

2a

The equation is now complete.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

6 Inserting the equation into your document

- 1 Click anywhere in the document outside the equation box.

You will be returned to the document with the finished equation in place.

- 2 Click away from the equation to de-select it.

You can use Cut, Copy and Paste with the equation as you would with normal text. Simply click anywhere on the equation to select it.

6.1 Editing an inserted equation

If you decide, after inserting an equation into a document, that you want to amend it, either click on the equation and then choose the command **Edit | Equation Object | Edit**, or simply double-click on the equation. The Equation Editor box containing your equation and the Equation toolbar will appear. Edit the equation as you wish and insert it into your document as before.

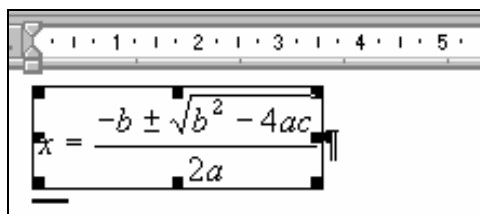
If you are building a large, complicated equation you may wish to keep inserting the equation into the document and saving the document. You can then return to the equation by double-clicking on it and continue to build it.

6.2 Resizing an equation

Because the equation has been inserted as an Object you can control its size in the document.

- 1 Click anywhere on the equation.

A box appears around the equation. It has eight small squares around it, known as sizing handles.

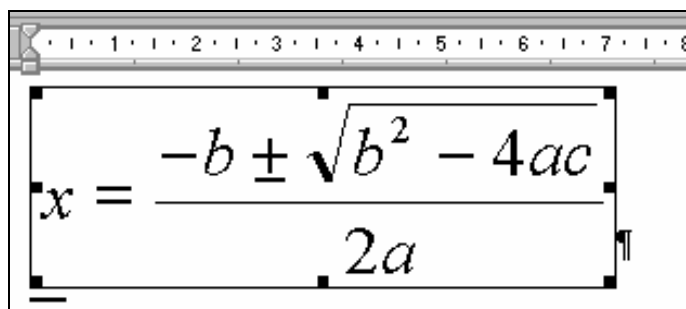


- 2 Position the pointer on the sizing handle at the bottom right-hand corner of the box.

The pointer changes to a double headed arrow.

- 3 Click and drag the mouse down and right, enlarging the box to about twice its original size.
- 4 Release the mouse button.

The equation should now be roughly double in size.


$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For more exact sizing use the **Format | Object** command from the menu bar. Click on the **Size** tab and enter exact percentage figures in the scaling boxes.

You can also change the font style and size of elements of the equation from within Equation Editor. Consult the on-line Help in Equation Editor for details.

7 More on building an equation

7.1 Enlarging the Equation Editor

You may find it easier to work in the equation editor if you use the **View | Zoom** command in the document window to set the zoom to 200% before starting the Equation Editor. This does not affect the printed size of the equation. A 400% zoom is particularly useful when making fine adjustments to the spacing of items (nudging).

7.2 Equation order

You don't have to create an equation in a particular order. For example you can create the numerator (top) of a fraction first. When you want to create the fraction, select the numerator and click the **Fraction and radical** template. The selected expression (numerator) appears in the top slot and there is a blank slot ready for the denominator.

7.3 Moving around an equation

You can move between the elements in an equation by clicking with the mouse or using the arrow keys. Pressing the **Tab** key will move the insertion point to the next slot in the equation. Press **Shift** and **Tab** to move to the previous slot.

7.4 Selecting equation items

You select most equation items just as you do in other Windows applications. There are however additional methods for selecting slots, matrices and the symbols inserted as part of templates, such as character embellishments and summation signs. These are summarised below.

To select	Do this
An area of an equation	Click the starting point and drag over the area.
A symbol that is part of a template e.g. ()	Hold down the Ctrl key. When the pointer changes to an outline arrow, click on the symbol.
A template (symbols and slot contents)	Position the insertion point to the left of the template and press the Delete key.
A slot's contents	Double-click anywhere in the slot.
A matrix	Drag over the expressions in the matrix.
An entire equation	Choose Edit Select All from the menu or double-click anywhere within the outermost slot.

7.5 Deleting equation items

Characters and symbols can be deleted by using the backspace and Delete keys as with ordinary text.

To delete the contents of a slot select the contents first and then press the **Delete** key.

Empty slots can sometimes be deleted by selecting them and using the **Edit | Clear** command. Some slots however cannot be deleted without also deleting the template that contains them. For example, you can't delete the integrand slot from an integral.

To delete a template, select it and all its slots and press the **Delete** key.

A selection can be deleted by:

- pressing the **Delete** key
- choosing **Clear** from the **Edit** menu
- typing something which will replace the selected area

If you need to undo a deletion, immediately select **Undo Typing** from the **Edit** menu.

7.6 Entering text in an equation

By default the Equation Editor applies an italic font to text. You may, however, want to include plain text within an equation, as in

$$|x_n - x_0| < \varepsilon \text{ for all } n \geq N$$

This is done by using the Text style mode.

To enter text in an equation:

- 1 Select **Style | Text** from the menu bar.
- 2 Type in the text.
- 3 Select **Style | Math** to return to the usual Math style mode.

You can use the spacebar when in Text style. Other styles — **Function**, **Variable**, **Greek**, and **Matrix-Vector** — are also available.

8 Alignment and spacing

The Equation Editor automatically applies spacing and alignment to the equation. You can change these in several ways:

- The Spaces and Ellipses symbols include blank spaces that can be inserted into an equation. The **View | Show All** command from the menu bar will display any space symbols that have been inserted this way.
- You can make fine adjustments by moving elements. This is known as **nudging**. Select the element you want to adjust and then press an arrow key while holding down the **Ctrl** key. Special symbols can be created by moving one character on top of another.
- You can also control the default spacing used by the Equation Editor (select **Format | Spacing**). Consult the online Help in Equation Editor for details.

8.1 Redrawing an equation

If you have repositioned elements of an equation there may be small parts of symbols left displayed. You can redraw the equation by choosing the command **View | Redraw**. This will “clean up” the display.

8.2 Aligning a pile of equations

If you have several equations that are displayed on consecutive lines you can align them by using the **Format | Align** commands.

- 1 Enter all the equations, pressing **Enter** to move to each new line.
- 2 Click anywhere within the equations.
- 3 Select **Format**.
- 4 Select the required alignment. (Choose **Align at =** to line up all the equations at the = sign.)

An alternative method is to insert an alignment symbol into each equation at the appropriate place. You can find this symbol in the top left position of the **Spaces and ellipses** menu — it looks like a vertical line of dots with a triangle at the bottom. The Editor will automatically line up the symbols on each line. The alignment symbols will not show in the printed document.

8.3 Numbering equations

If some equations in your Word document are to be numbered, it is probably best not to use the Equation Editor to produce the equation numbers. Instead, just type the numbers into your Word document.

For an attractive layout, you could position your equation in the middle of the page using a centre-aligned tab. Then position its equation number near the document's right (or left) margin using a right (or left) aligned tab.

9 Shortcut keys

When working on a large equation you may find it more convenient to use the keyboard to apply commands. Shortcut keys are especially useful for commonly repeated actions. A full list of the shortcut keys can be found in Help from within the Equation Editor.

- 1 Select **Help | Equation Editor Help Topics**.
- 2 With the **Contents** tab selected, double-click on **Reference Information**.
- 3 Double-click on **Keyboard Guide**.

Pages can be printed out for easy reference (click on the **Options** button).