

Using the Equation Editor

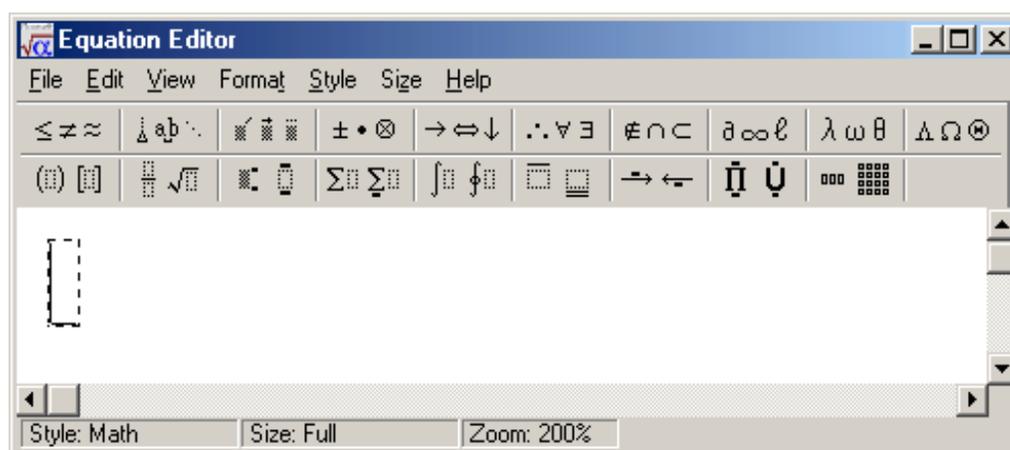
Inserting an Equation

To insert an equation, do one of the following.

Word : **Insert / Object / Microsoft Equation 3.0**
WordPerfect : **Insert / Equation**

If you are using Word on your home computer, you may want to add the equation editor to the toolbar so that it is much quicker to add equations. There are instructions for adding it to the toolbar at the end of this document.

You will get a screen that looks like this:



The Equation Editor included with Word and WordPerfect is a watered down version of the full MathType editor by Design Science. There are many more bells and whistles available with the full version of MathType. Anyone doing serious mathematics writing should consider getting the full version. The academic pricing is \$99. You can learn more about MathType at <http://www.mathtype.com/>

For purposes of this course, the regular equation editor that comes with Word or WordPerfect will suffice.

Create your equation using the helps that follow. WordPerfect users need to press Ctl+S to save and update the object and Ctl+F4 to exit the equation editor when done. Word users just need to click outside the box to update the equation and continue typing.

SYMBOLS : Top Row (Left to Right)

Relational Symbols

- \leq Less than (Ctl+K, ,)
- \geq Greater than (Ctl+K, .)
- \neq Not equal to
- \approx Approximately equal to

Embellishments

- x' Prime (Ctl+Alt+')
- x'' Double Prime (Ctl+Alt+"")
- \bar{x} Overbar (Ctl+_)
- \hat{x} Hat

Arrow Symbols

- \rightarrow Right Arrow
- \Rightarrow Right double arrow
- \Leftrightarrow Left/Right double arrow

Set Theory Symbols

- \in Element of
- \cup Union
- \cap Intersection

Greek Characters (lowercase)

Most Greek letters can be accessed by Ctl+G and then the English letter corresponding to the Greek letter. A few exceptions are F for ϕ and Q for θ .

Spaces and Ellipses

- ' ' Thin space (Ctl+Alt+Space)
- ... Dots on axis

Operator Symbols

- \pm Plus or Minus
- \mp Minus or Plus
- \times Multiplication (Ctl+K, t)
- \div Divide
- \cdot Dot operator (Ctl-Shift-K, .)

Logical Symbols

- \therefore Therefore
- \because Because
- \exists There exists
- \forall For all / for each

Miscellaneous Symbols

- ∞ Infinity (Ctl+K, I)
- ∂ Partial Derivative (Ctl+K, D)
- ∇ Gradient
- $^\circ$ Degree

Greek Characters (uppercase)

Most capital Greek letters can be accessed by Ctl+G and then hitting the corresponding English letter while holding down the Shift key.

TEMPLATES : Bottom Row (Left to Right)

Fence Templates

You should always use the templates whenever you have matching grouping symbols.

$()$	Parentheses (Ctrl+9)
$[]$	Brackets (Ctrl+[)
$\{ \}$	Braces (Ctrl+{)
$ $	Absolute Value (Ctrl+T,)

Subscript and Superscript Templates

x^2	Superscript (Ctrl+H)
x_1	Subscript (Ctrl+L)
x_1^2	Super & Subscript (Ctrl+J)

Integral Templates

$\int x dx$	Indefinite Integral
$\int_1^4 x dx$	Definite Integral (Ctrl+I)

Labeled Arrow Templates

There is very little use for these in our courses.

Matrix Templates

Use this to create any matrix. There are several predefined matrices plus the ability to create any size matrix.

Fraction and Radical Templates

$\frac{2}{3}$	Full size fraction (Ctrl+F)
\sqrt{x}	Square Root (Ctrl+R)
$\sqrt[n]{x}$	n th root

Summation Templates

$\sum x_k$	Summation, no limits
$\sum_{k=1}^n x_k$	Summation w/ limits (Ctrl+T, S)

Underbar and Overbar Templates

These are used when you need to put an embellishment over more than one character. Do not use them for x-bar.

\overline{AB}	Ray
\underline{AB}	Line

Product and Set Theory Templates

There is very little use for these in our courses.

Styles

There are several styles that determine how entered text will be displayed. Each style is in effect until the style is changed to something different. The exception being that you can go back to math style by using a mathematical template.

MATH (Ctl++)

The math style is what you should use to enter mathematical expressions. Use the TAB key to move from one section to another. If you want to enter spacing, you will need to do it manually using Ctl+Alt+Space or the pull down spaces palette. Letters appear in italics unless it forms a known function, like sin, cos, tan, mod, det, etc.

TEXT (Ctl+Shift+E)

The text style allows you to enter text that is not part of a mathematical expression. Text is in regular font and spaces appear as spaces. No formatting is done to mathematical expressions. Use this when you want to type words like "expected" or "variation".

FUNCTION (Ctl+Shift+F)

The function style allows you to enter the name of functions that are not recognized automatically. The regular font is used and no spaces are allowed.

VARIABLE

The variable style places the text into italics and is used to override the text mode.

GREEK

The Greek style displays all text as Greek letters. Not extremely useful.

MATRIX-VECTOR (Ctl+Shift+B)

The matrix-vector is a bold, non-italic font. If you hit Ctl+B instead of Ctl+Shift+B, then it will apply only to the next character. Matrices are denoted with capital bold letters. Vectors in print are denoted with bold small letters or in writing with a vector symbol ($\vec{}$) over the vector name.

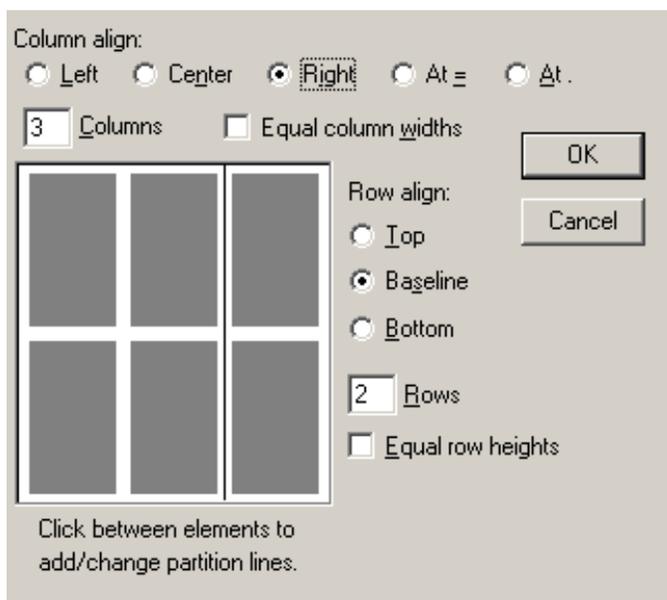
Examples

Create the following summation: $\sum_{k=1}^n (k^2 - 1)$

1. Click on the summation with limits template (or use Ctl+T, S)
2. Create a set of matched parentheses (use Ctl+9, which is Ctl+left ())
3. Type **k** then Ctl-H for a superscript
4. Enter the superscript of **2** and then press Tab to return to the main level
5. Type **-1** and then press Tab to move to the lower index
6. Type **k=1** and then press Tab to move to the upper index
7. Type **n**
8. Press Ctl+S to save the file and Ctl+F4 to close the equation editor.

Create the following matrix expression:
$$\left[\begin{array}{cc|c} 2 & 1 & 5 \\ -1 & 3 & 7 \end{array} \right]$$

1. Create the [] that surround the matrix by hitting Ctl+[
2. Go to the matrix creation template and choose the generic size (the one in the lower right hand corner). You will get a screen that looks like this (after some modifications):



Although the Equation Editor will allow you to go back and change the formatting of the matrix by using the Format / Matrix command, please take the time to make sure you get it properly configured before clicking OK and you can save yourself some work.

3. This matrix has **2 rows** and **3 columns**. Enter those numbers into the appropriate boxes (yes, I know they are backwards and you have to enter the number of columns first, the full version of MathType has fixed that). The numbers are **right aligned**.
4. Also notice that there is a partition line between the 2nd and 3rd columns. To insert this line, position the mouse between the second and third column and click the left mouse button. This will insert a solid line. If you click again, it will change to long dashes, another click changes it to short dashes, and a fourth click will get rid of the partition line.
5. Once you have the matrix configured the way you want it to look, click **OK**.
6. Now, enter the numbers into the matrix from left to right and top to bottom, following each one with a Tab to move to the next cell in the matrix. For our data, this would be **2 Tab 1 Tab 5 Tab -1 Tab 3 Tab 7**
7. Press Ctl+S to save and update the object and Ctl+F4 to close the equation editor.

Create the quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

1. Type **x=**
2. Generate a fraction by hitting Ctl+F or choosing the fraction template.
3. Type **-b** and then choose the \pm from the Operator Symbols palette.
4. Choose the square root template from the Fraction and Radical Templates or just hit Ctl+R.
5. Type **b** and then Ctl+H to go into superscript mode, followed by **2** to get the squared. Press Tab to return to the main level.
6. Type **-4ac** and then press Tab to get out from under the radical and Tab again to move to the bottom of the fraction.
7. Type **2a**
8. Press Ctl+S to save and update the object and then Ctl+F4 to exit the equation editor.

Create the system of linear equations:
$$\begin{cases} 2x + y = 5 \\ x - 2y = -1 \end{cases}$$

1. Choose the left brace from the Fencing Template
2. Create a 2 row by 5 column matrix with no partition lines and the elements right aligned (see the matrix example).
3. Choose Format / Spacing and change the matrix row spacing to 100% (be sure to put the % sign at the end).
4. Type **2x** Tab + Tab **y** Tab = Tab **5** Tab **x** Tab - Tab **2y** Tab = Tab **-1**.
5. Press Ctl+S to save and update the object.
6. Go to Format / Spacing and hit Default to reset the matrix spacing to its default 150%.
7. Press Ctl+F4 to close the equation editor. If it asks you to save or update the object, choose No. The reason for this is that the next expression using matrices will remember the 100% line spacing unless you reset it back.

Create the matrix equation: $\mathbf{X} = \mathbf{A}^{-1}\mathbf{B}$

1. Press Ctl+B to place the equation editor into Matrix-Vector style. Then type **X**
2. Since you hit Ctl+B instead of Ctl+Shift+B, the equation editor has reverted back to the math style so type =
3. Press Ctl+B and then **A**
4. Press Ctl+H to go into superscript mode and then **-1** to get the inverse symbol. Press Tab to exit the superscript mode.
5. Press Ctl+B and then **B**
6. Press Ctl+S to save and update the object and then Ctl+F4 to exit the equation editor.

Common Problems

There are some common problems that students seem to have each semester. I will try to address some of those here.

My word is partially italicized and looks like *variation*. Where is the bar symbol?

Create the statistical expression $\text{variation} = \sum (x - \bar{x})^2$

There are two problems that are addressed here. The first is that if you type "variation", it will show up in the equation editor as "*variation*" because "var" is a recognized function name. The other problem is the bar over the x. While the bar is listed on the shortcut page, people seem to have great difficulty finding it. There are two methods of getting a line over a character. The first is the overbar (Ctl+Underline) and the second is the overline. Do NOT use the overline.

1. Press Ctl+Shift+E (make sure it's a capital E ... or go to Style / Text) to place the equation editor into text mode. Then type **variation**
2. Press Ctl+Plus (or go to Style / Math) to put the equation editor back into the math mode. Type =
3. Go to the summation template and choose the summation symbol without limits. Σ
4. Start a parentheses by pressing Ctl+9
5. Type **x-x**
6. Press Ctl+_ (Ctl+Underline or go to the embellishments icon bar [3rd on top row] and choose overbar) to get the bar over the x. Do NOT use the overline from the second row of icons.
7. Press Tab to move outside the parentheses.
8. Press Ctl-H to go into superscript mode and then type **2**
9. Press Ctl+S to save and update the object and then Ctl+F4 to exit the equation editor.

I can't find x in the symbols.

The characters that you can type on the keyboard are not (for the most part) in the equation editor. If you need an x or y or + or -, just type them on the keyboard.

How do I line things up in multiple columns?

The trick is to use a Matrix. Just don't put symbols around them. For instance, the following is a 1x3 matrix.

$$\sin^2 x + \cos^2 x = 1 \quad 1 + \tan^2 x = \sec^2 x \quad 1 + \cot^2 x = \csc^2 x$$

You can also use tables in your word processor and put one equation in each cell or use tabs to line things up.

Help! My computer doesn't have equation editor loaded on it.

The typical installation of Microsoft Word does not install the equation editor. Follow these steps to install it. You will need the Office CD if the files are not pre-installed on your computer. These instructions are for Office 2000 on a Windows XP machine, but similar instructions work for Office 97 (and possibly Office XP) and other versions of Windows.

1. Click on Start and select the "Control Panel"
2. Choose "Add or Remove Programs"
3. Click on "Microsoft Office" (there is probably some more text, like "2000 SR-1") and then click "Change".
4. Click on "Add or Remove Features"
5. Click on the "+" in front of "Office Tools" to expand the list
6. Click on the box in front of "Equation Editor" and choose "Run from My Computer"
7. Click "Update Now"
8. Follow the prompts during the installation.

Inserting an equation takes too long. Isn't there an easier way?

You can add the Equation Editor icon to the toolbar so that you can just click one button whenever you want to insert an equation. This will save you a lot of time. Here are the steps for doing this with Word 2000. Other versions of Word should be similar.

1. Click the right mouse button on the toolbar and choose "Customize"
2. Click on the "Commands" tab
3. Click on the "Insert" category
4. Scroll down the "Commands" menu about 80% of the way and you'll find "Equation Editor"
5. Click and hold the left mouse button on the equation editor
6. Drag the equation editor to the place on the toolbar where you want it and then let go of the mouse button
7. Click on "Close"