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FX Equation 3
Simply the Fastest Way to Type Equations

FX Equation 3

User's Guide

by Efofex Software

Efofex Software is distributed in the UK and Ireland by Chartwell-Yorke

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FX Equation 3

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1 Features

1.1 Basic Concept

FX Equation is an equation editor that takes the chore of formatting equations away from you. It is for people who love the output from the modern equation editors but **hate** using them. FX Equation automatically formats, with a minimum of input from you, just about all of the equations an average mathematics teacher uses everyday.

First a simple example:

If you want a simple equation in your document

$$F = \frac{v^2}{r} = \omega^2 r$$

normally you would have to load a large and cumbersome equation editor or type the equation into your word processor and manually italicise the variables and superscript the powers. Alternatively you could load FX Equation and type

`F=v2/r=om2r`

and press Enter.

FX Equation understands enough about equations to correctly format this for you.

Other examples of equations FX Equation can format include:

Limits `ga=lim(n=>inf)(sigma(k=1,n) 1/k- ln n)=0.5772` gives you

$$\gamma = \lim_{n \Rightarrow \infty} \left(\sum_{k=1}^n \frac{1}{k} - \ln n \right) = 0.5772$$

Integrals `s(t) = s\0 + int |v(t)| dt` gives you

$$s(t) = s_0 + \int |v(t)| dt$$

Vectors `(3,2)` gives you

$$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

Fractions `pi/4` gives you

$$\frac{\pi}{4}$$

2 Licence Statement

2.1 General Conditions

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3 Installation

3.1 System Requirements

FX Equation will run on any computer running Windows 95 or later. FX Equation is compatible with Windows 95/98/Me/NT/2000 and XP. A word processor is required to use FX Equation to its best potential. Efofex specifically supports Microsoft Word 97 and later.

3.2 Installing FX Equation on Your Computer

To install FX Equation onto your system:

- Put the CD into your computer.
- If the CD does not Auto run,
Win 95/98/NT/2000/XP Choose Run from the Start menu
Type d:\setup Where d is your CDRom's drive letter.
- Push the Product Information & Installation button
- Select FX Equation from the list of available programs
- Push the Install button

The install program will ask you which directory you would like FX Equation to be placed in and will then make all necessary adjustments to your system.

The CD will install a time-limited version of the product. If you do not enter registration information within 30 days of installation, the product will begin to operate in evaluation mode. If you have purchased a registration for FX Equation, you should have received a Registration Sticker and CD booklet with your copy of the software that explains the registration process more fully. FX Equation is designed to be used as an OLE object, linking into Word and this is the main way it should be used. There is no need to create an icon for FX Equation, it should be accessed as an object through your word processor.

Equation Editor and Word Art are other examples of objects in Word for Windows.

3.3 Installation Notes

3.3.1 Administrator Privileges

FX Equation needs to write to the registry to install itself properly. On some systems you might require administrator privileges to achieve this. Your IT supervisor will be able to do this. You do NOT need administrator privileges to run FX Equation normally.

3.3.2 Adding To Word

Adding FX Equation to Word is automatic. You need to know which version of Word you are using and make sure you select the correct option in the setup program.

We recommend that Word is not running when you install FX Equation.

3.3.3 Registration

If you are evaluating the software and wish to purchase:

- Choose the licence you require. For a full description of the licences available, read the licence information file on this disk.
- Contact Chartwell-Yorke by post, fax or email for the latest prices. Alternatively the latest prices are available from our web site at www.chartwellyorke.com
- Purchase a registration code from Chartwell-Yorke and use the instructions below to register your copy.

If you have purchased the software and have received a CD with attached Registration Information:

You have all the information necessary to register your copy of the software.

To Register your copy:

- From the Help menu of FX Equation, choose Register FX Equation...
- Press the Register Now! button.
- Type in your Registered Name and Registration Code EXACTLY as supplied. You MUST enter your registered name using the same capitalisation, the same spaces, the same abbreviations, even the same spelling errors (if we have made any) as the registered name we have supplied.

FX Equation will now operate correctly past the thirty day evaluation period.

3.3.4 Adobe Acrobat

All manuals are provided in Adobe Acrobat PDF format. In order to read and print the manuals you will need to obtain a copy of Acrobat Reader V4.0 or later.

The Acrobat reader is available as a free download from www.adobe.com and is included on our CD.

Before downloading a copy of the reader, try clicking on the supplied PDF files. You are quite likely to already have a copy of Acrobat Reader installed on your system.

3.3.5 Changes FX Equation Makes (Advanced)

A standard installation of FX Equation makes the following changes to a system.

- FXE300.exe, word documents and templates, PDF versions of manuals and quick reference cards, an uninstall program and log are all placed in the installation directory (c:\Program Files\Efofex\FXE by default).
- FX Equation's uninstall information is included in the Add/Remove Programs section of Control Panel. This can be disabled by removing the uninstall program and log from the installation subdirectory.
- FX Equation registers itself as an OLE object in the registry (HKEY_CLASSES_ROOT).
- Registration information is stored in an ini file saved to the All Users profile. (c:\Documents and Settings\All Users\Application Data\Efofex is a likely location). If FX Equation cannot determine profile information, it will store the ini file in FX Equation's application directory.
- Individual users preferences are stored in a .ini file that is saved into their profile. (c:\Documents and Settings\%username%\Application Data\Efofex is a likely location). This file also contains any entered registration information. Copying this file to the Default User profile or All Users profile can assist in network installations. If FX Equation cannot determine profile information, it will store the ini file in FX Equation's application directory.
- Word macros and toolbars are stored in FXEquation.dot. By default, this file is placed in Word's application startup directory (C:\Program Files\Microsoft Office\Office\Startup for example). In networked installations, you may wish to move this file to another startup directory – see the next topic for details. This file has been digitally signed by Efofex Software and must be trusted to install.

Word 97 uses a different file, FXEquation97.dot, but all other details are the same.

- It is likely that installation of FX Equation will require Administrator privileges.

3.3.6 Automatic Registration and Configuration (Advanced)

FX Equation has a number of built-in systems that make automatic registration and configuration easy.

Simple Configuration File

FXE3.ini is a normal .ini file that can be copied into anyone's profile or placed into the default user profile.

Default Configuration & Registration System

At any stage, you can write a default configuration file. Set up a registered copy of FX Equation and choose Write Default Configuration File from the Tools menu. This file, FXE3_Default.ini, will be written to FX Equation's application directory. This file can greatly simplify your installation.

When FX Equation first starts, it checks to see if there is a Default Configuration file in its directory. If there is, it loads all the options from the file, saves these options into the user's profile, and then attempts to delete the default configuration file. No error is generated if FX Equation cannot delete the file. This behaviour means that you can use the default configuration file in one of two ways:

- Ensure that there is a copy of FXE3_Default.ini in FX Equation's directory and let it customise FX Equation for you. Once it is automatically deleted, the user is free to customise their copy of FX Equation.
- You can make FXE3_Default.ini read only (or make it part of the standard operating environment) so that FX Equation is ALWAYS reset back to your standard configuration when it is run.

Integrate with Word

Configuring Word involves copying FXEquation.dot into a startup directory that is accessible to the user. Word, by default, loads all templates that are located in a startup directory. There are three startup directories that can be used.

- The application has its own startup directory. This will often be C:\Program Files\Microsoft Office\Office\Startup but this obviously depends on your setup. The FX Equation setup program will automatically copy the FXEquation.dot into this directory.

- The All Users profile has a Word startup directory. This will often be C:\Documents and Settings\All Users\Application Data\Microsoft\Word\STARTUP.
- Each user has a Word startup directory. This will often be C:\Documents and Settings\%username%\Application Data\Microsoft\Word\STARTUP

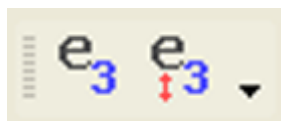
You should only have the FXEquation.dot file in ONE of these locations.

4 FX Equation and Word

4.1 Adding FX Equation to Word

Adding FX Equation to Word is handled automatically by the installation program. Make sure you select your version of Word from the list. When you first use Word after installing FX Equation, you may be asked if you trust the document and macros that have been signed by Efofex Software. You **MUST** trust the macros if you are to use FX Equation properly.

When you open Word you will see a new toolbar with two FX Equation buttons.

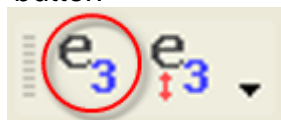


The left hand button inserts a new equation into your document. The right hand button adjusts the level of an existing equation.

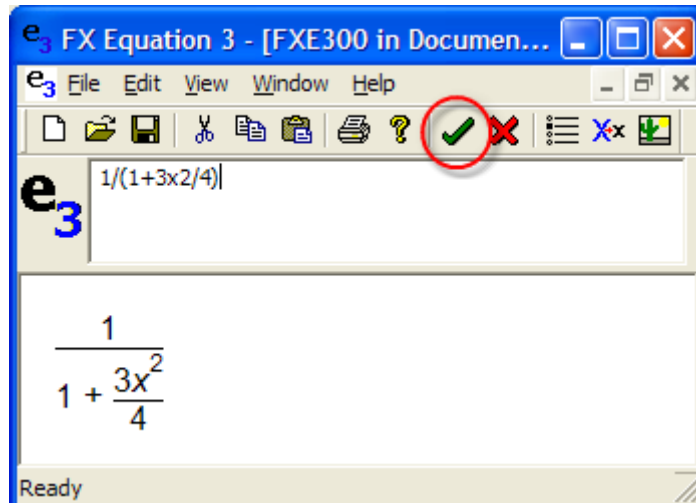
4.2 Using FX Equation in Microsoft Word

Simply:

- Push the left hand toolbar button



- FX Equation will open a new window



- Type your equation in the box at the top of screen - your equation will appear, formatted, in the bottom area of the screen
- When you are finished, click on the green tick and you will be returned to Word.

The equation will appear in your document adjusted to the correct level.

Note: FX Equation can be accessed by using the Insert/Object command from the menus **but your equations will not be adjusted to line up with other text.**

5 Using FX Equation

5.1 How to Enter the Equations

Equations are entered into FX Equation by typing what you see WITHOUT formatting. On most occasions FX Equation will automatically format your equation for you.

For example. If you want the equation

$$3x^3 + 2x^2 - 7$$

simply load FX Equation and enter **3x3+2x2-7**. FX Equation automatically formats the powers and italicizes the variables.

Simple fractions are also entered as you see them. In other words if you want

$$\frac{3x^3}{2x^4}$$

you enter it as **3x3/2x4** and FX Equation will automatically build the appropriate fraction. Most simple equations can be entered this way, with NO formatting on

your part. More complicated equations will require some extra input on your part.

5.2 Editing Your Equations

If you wish to edit the equation at a later time, simply double click on the equation and you will be returned to the FX Equation window. You can make any desired changes to your equation and then click the green tick when you are happy with the changes.

5.3 Symbols

Scientists use a large number of specialised symbols and FX Equation attempts to make accessing these symbols as easy as possible. Any symbol that is not on the keyboard is entered using one of two methods.

Either

A key is designated to be automatically replaced. The two symbols that use this approach are

- *uses the ` key (usually next to the 1 on the keyboard)*
- × *uses the * key. The * symbol is often used to represent multiplication on computers.*

or

A code is used and this code is automatically replaced with the appropriate symbol. The code chosen has been chosen to be easily remembered and is usually a logical combination of characters. For example

≤ *is built from < and = so the code is <=*

≈ *is built from two wavy lines so the code is ~ ~*

Some codes are built from the word describing the symbol.

∞ *(infinity) the code is inf*

Code	Symbol
< =	≤
> =	≥
< > or = /	≠
= ~ or ~=	≡
~ ~	≈
- =	≡
+ -	±
*	*, × or ·
/ (followed by a space)	÷
` or o	◦
- >	→
= >	⇒
inf	∞
tri	Δ
ang	∠
perp	⊥
and	∩

or	\cup	
element	\in	
notelement		\notin
subset	\subset	
notsubset	$\not\subset$	
prosubset	\subseteq	
prop	∞	
tf	\therefore	

Note: Some symbols have two codes.

Examples:

$0^\circ \leq x \leq 360^\circ$ is entered as `0` <= x <= 360o`
 $x \rightarrow \infty$ is entered as `x -> inf`

5.4 Absolute Value

Absolute values are entered with the `|` key. On most keyboards it is above the Enter key and shares the key with `\`. To enter `|` you hold Shift when entering.

On some keyboards, especially languages other than English, this key is shown as two vertical dashes - one above the other.
 eg.

|
|

Absolute value signs are difficult for FX Equation because they have no "direction". Unlike other brackets, you can not easily tell if `|` is opening a new absolute value or closing an existing one. If FX Equation interprets your absolute value incorrectly, you can use this code:

<code>[[</code>	absolute value followed by square bracket	opens an
absolute value		
<code>]]</code>	square bracket followed by an absolute value	closes an
absolute value		

The square bracket will not be displayed - it is only used to indicate the direction of the absolute value sign.

$$\left| \frac{|x| - |y|}{2} \right|$$

is entered as `[[(|[x]| - |[y]|)/2]]`

5.5 Degrees

Degrees signs are entered with the ` key. This is normally the key NEXT to the 1 key and it normally produces a ~ when pressed whilst holding down the Shift key.

The ` key is a backwards single quote. It is not the normal ' key (next to semicolon).

Alternatively, you can enter degrees using the lowercase o.

eg

32` 32°

32o 32°

5.6 Greek Letters

All Greek letters are supported. They are all entered using a two character code. The two character code is always the first two letters of the letter's name. Upper case Greek letters that use the same character as normal text are not explicitly supported. (eg upper case alpha = A)

Code	Lower Case Greek Letter	
al	α	alpha
be	β	beta
ga	γ	gamma
de	δ	delta
th	θ	theta
la	λ	lambda
mu	μ	mu
pi	π	pi
rh	ρ	rho
si	σ	sigma
ph	ϕ	phi
ch	χ	chi
om	ω	omega

Code	Upper Case Greek Letter	
DE	Δ	delta
OM	Ω	omega

Examples:

$\frac{\pi}{4}$

is entered as **pi/4**

$\sin^2 \theta$

is entered as **sin2 th**

5.7 Square Roots

sqrt or sr may be used to indicate square roots. Complicated square roots will need to be surrounded with brackets. Square roots may be included as part of more complicated equations.

Examples:

$\sqrt{4}$ is entered as **sr 4** or **sqrt 4**

$\sqrt{x^2 + y^2}$ is entered as **sr(x2+y2)** or **sqrt(x2+y2)**

$\frac{\sqrt{3}}{2}$ is entered as **sr3/2**

5.8 nth Roots

Any root of a function can be shown using the root keyword.

Examples:

$\sqrt[3]{x}$ is entered as **3root x**

$x\sqrt{2x^2}$ is entered as **xroot (2x2)**

5.9 Fractions

We have already seen how to enter some simple fractions. Fractions with complicated numerators or denominators must have the numerator and/or denominator surrounded by brackets. These brackets will not be displayed, they are used as logical brackets so that you clearly indicate the elements that comprise the numerator and denominator.

Examples:

$\frac{3x + 2}{4}$ is entered as **(3x+2)/4**

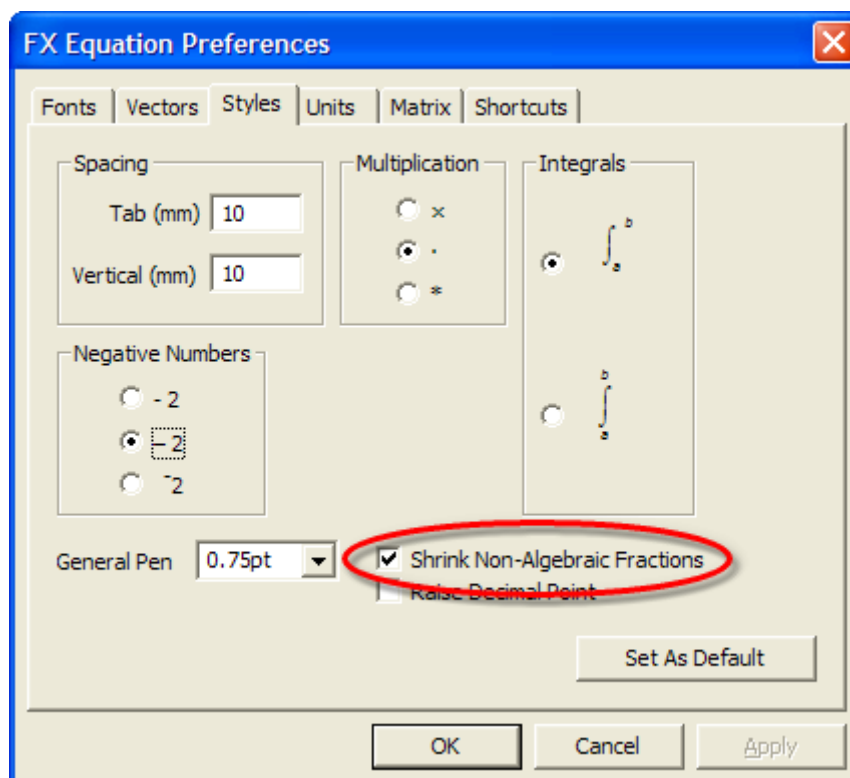
$\frac{(x + 1)^2(x + 2)}{x + 1}$ is entered as **((x+1)2(x+2))/(x+1)**

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a^2}$ is entered as **x=(-b +- sr(b2-4ac))/2a** or you can use the qf standard shortcut.

$$\frac{1}{1 + 4x^{\frac{3x}{2}} + \frac{1}{2x^2 + \frac{1}{2}}}$$

is entered as 1/(1+4x^(3x/2)+1/(2x2+1/2))

FX Equation can be set to shrink non-algebraic fractions (like the 1/2 in the equation above). This usually produces superior results and is necessary for the display of mixed numerals



5.10 Using Brackets

We have already seen the use of brackets to logically identify the numerator and denominator in complicated fractions. This is a very important use of brackets. Brackets are also used to logically identify powers and subscripts.

All three bracket types {, [and (may be used interchangeably in FX Equation and FX Equation makes no distinction between them. FX Equation does not even check to see if brackets are paired. You are responsible for this. If there is a fraction inside a bracket, the bracket is automatically resized.

Example:

$$3 \left[(x-2)^2 + \frac{1}{2} \right]$$

is entered as 3[(x-2)2+1/2]

5.11 Powers

Most powers will be automatically recognised by FX Equation. FX Equation will not **automatically** recognise powers if

- you require a variable as a power
- you require a function as a power
- you require a power of a number
- you require a complicated power.

In these cases you need to explicitly indicate the power using the ^ symbol. As with fractions, complicated powers need to be surrounded with brackets. These brackets will not be displayed.

Examples:

x^2	is entered as x2
a^m	is entered as a^m
$e^{\sin\theta}$	is entered as e^(sinh)
3^2	is entered as 3^2
x^{2y+3}	is entered as x^(2y+3)
e^{x^2}	is entered as e^x2
$x^{\frac{1}{2}}$	is entered as x^(1/2)

5.12 Subscripts

The \ (backslash) symbol is used to indicate the next character or group of characters is a subscript. Complicated subscripts must be surrounded with brackets which will not be displayed. Please Note: On some keyboards (eg Swedish) the \ key is not accessible in Word. The § key can be used instead.

Examples:

T_n	is entered as T\n	(or T§n)
T_{n+1}	is entered as T\(n+1)	(or T§(n+1))

5.13 Integrals

Integrals can be entered using the int command.

Example:

$$\int x \, dx$$

is entered as `int x dx`

For definite integrals, the upper and lower bounds are placed in brackets and separated by a comma (see Decimals).

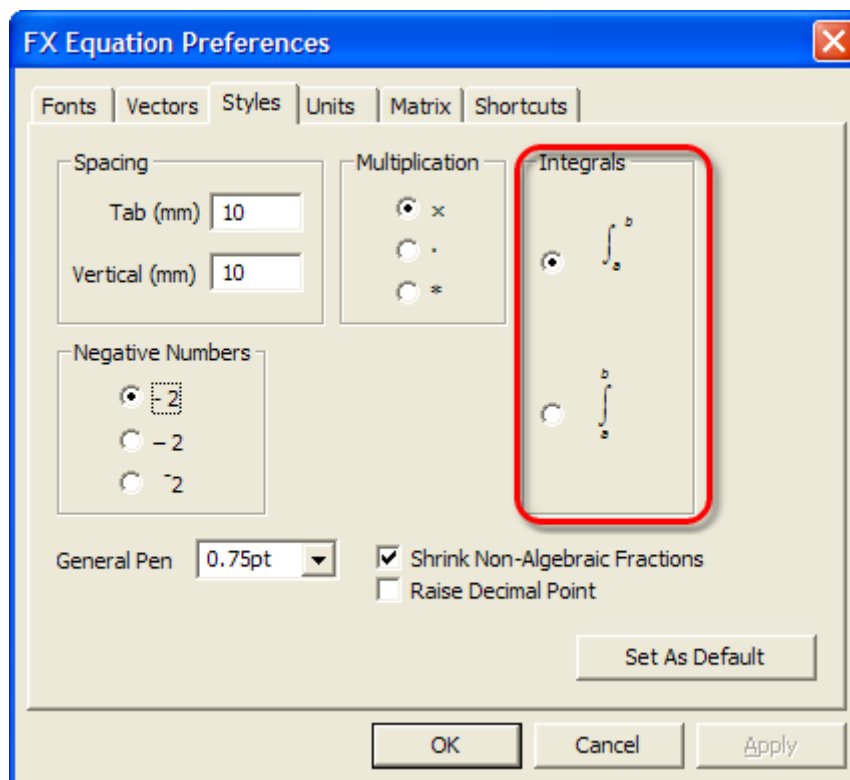
$$\int_{-1}^1 x^2 + 1 \, dx$$

is entered as `int(-1,1)x2+1 dx`

$$\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} e^{\sin x} \cos x \, dx$$

is entered as `int(pi/4,pi/2)e^(sinx) cos x dx`

Integrals can be drawn in two different ways - with the bounds to the right of the integral sign or with the bounds above and below. This option is set in the Styles section of the options.



5.14 Limits

Limits are entered using the lim command. The value the limit approaches is placed in brackets. Limits are the main use of the -> code which produces an arrow.

Examples:

$$\lim_{x \rightarrow 3} \frac{3x}{4}$$

is entered as `lim(x->3) 3x/4`

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

is entered as `lim(h->0) (f(x+h)-f(x))/h`

$$\lim_{x \rightarrow 1^-} h(x)$$

is entered as `lim(x->1+) h(x)`

$$\lim_{x \rightarrow \infty} \frac{5x^2 - 4x + 2}{3x^2 + 3x - 2}$$

is entered as `lim(x->inf)(5x2-4x+2)/(3x2+3x-2)`

5.15 Sigma Notation

Sigma notation is entered using the sigma command. The parameters are placed in brackets and are separated with a comma.

Example:

$$\sum_{i=1}^{10} x_i$$

is entered as `sigma(i=1,10) x\i`

5.16 Product Notation

Product notation is entered using the product command. The parameters are placed in brackets and are separated with a comma.

Example:

$$\prod_{i=1}^{10} x_i$$

is entered as `product(i=1,10) x\i`

5.17 Scientific Notation

FX Equation can automatically format scientific notation. The capital E followed by a number will be transformed into $\times 10$ to the power of the number.

FX Equation will correctly format numbers with negative exponents.

FX Equation will use the currently selected multiplication symbol (\times or \cdot).

Examples:

$$1.2 \times 10^{15}$$

is entered as `1.2E15`

$$-3.2 \cdot 10^{-1} + 1.2 \cdot 10^1$$

is entered as -3.2E-1+1.2E1

5.18 Vector Support

FX Equation supports many different ways of defining and displaying vectors. You can either indicate to FX Equation exactly what you want to show as a vector and how you want it shown or you can allow FX Equation to detect and display vectors automatically.

5.18.1 Column Vectors

If you wish to enter vectors in the vertical format, they are simply entered as (3,2) using a comma as a separator. Three-dimensional vectors are entered in the same way. If you normally use a comma as a decimal point, FX Equation will automatically detect this and you must use a semicolon to separate components of a vertical vector.

Examples:

$$\begin{pmatrix} 3 \\ 2x \end{pmatrix}$$

is entered as (3,2x) or (3;2x)

$$\begin{pmatrix} 3 \\ 2 \\ 5 \end{pmatrix}$$

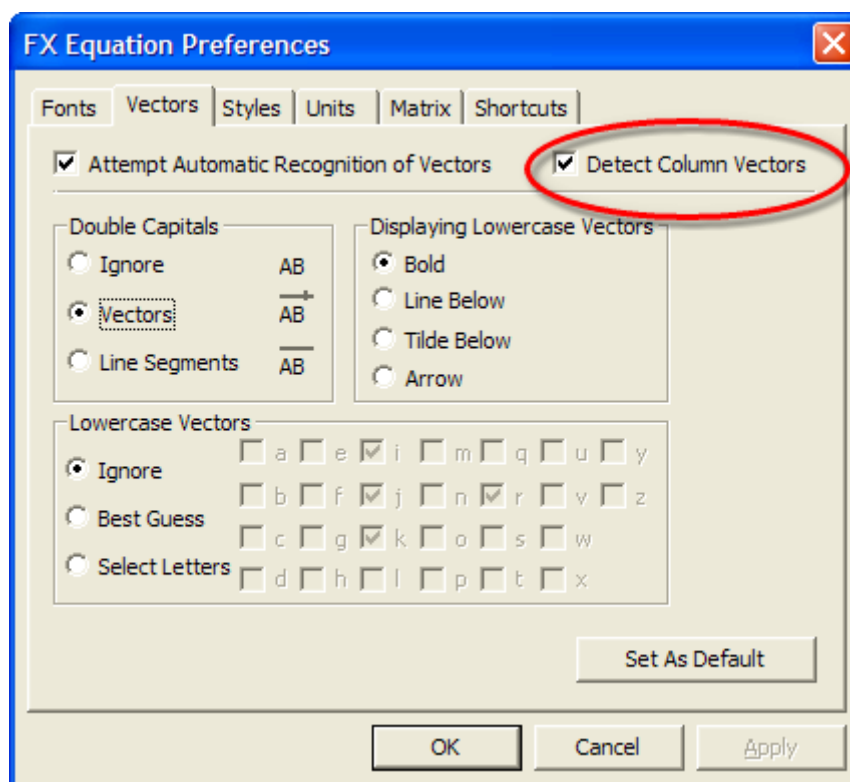
is entered as (3,2,5) or (3;2;5)

$$r = \begin{pmatrix} 2 \\ 7 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ -4 \end{pmatrix}$$

r=(2;7)+la(1;-4)

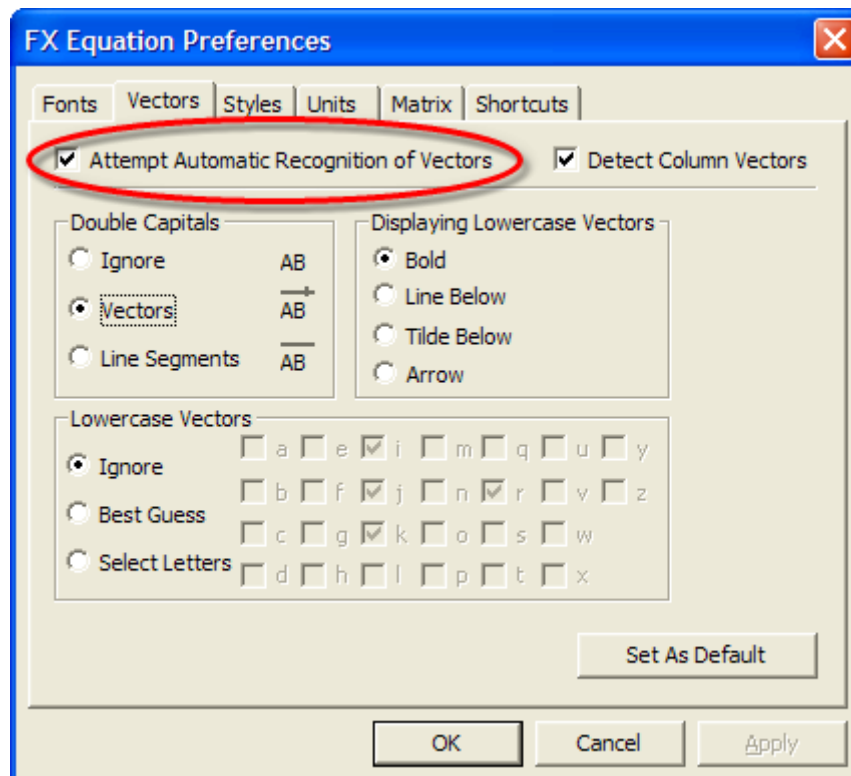
is entered as r=(2,7)+la(1,-4) or

You must have selected the Detect Column Vectors option to allow FX Equation to detect column vectors and matrices.



5.18.2 Automatic Vectors

FX Equation can automatically recognize some vectors if you choose to turn the feature on. FX Equation can recognize some lowercase vectors and double capital vectors. This feature is activated by default and can be controlled by choosing Edit Options from the Tools menu or by pushing the Options button.



5.18.2.1 Lowercase Vectors

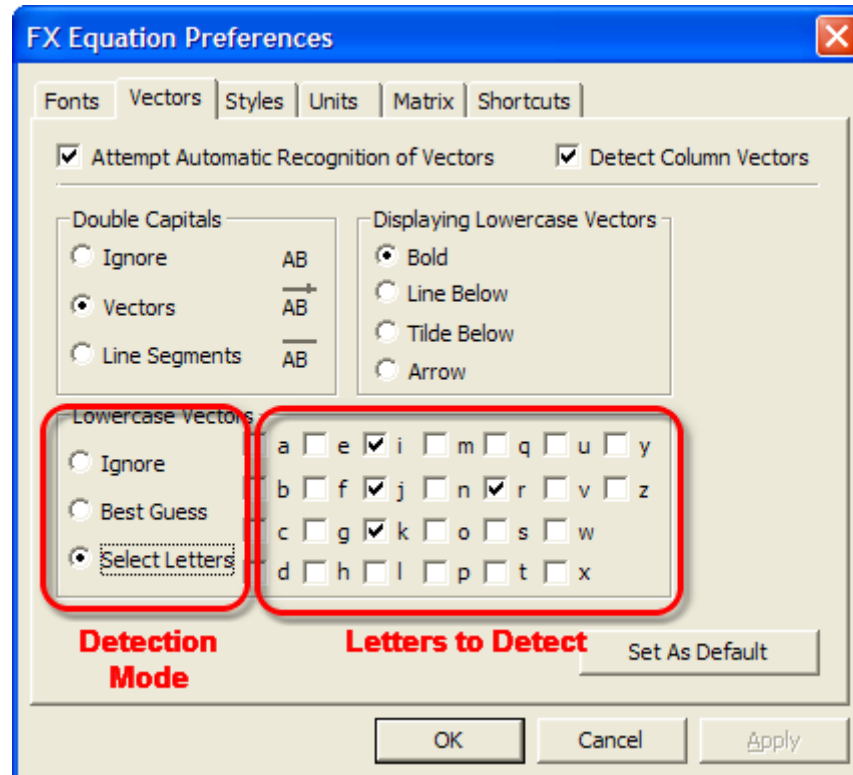
FX Equation will only detect lowercase vectors if automatic recognition is switched on.

If you are using vectors of the form

$$\mathbf{r} = 3\mathbf{i} + 2\mathbf{j}$$

FX Equation can automatically recognise that you are typing a vector and make the r , i and j bold. FX Equation can also be set to indicate vectors using lines, tildes or arrows, depending on your preference.

This automatic recognition of vectors can save you hours of time, but FX Equation may sometimes get the automatic recognition incorrect. By default, FX Equation will take its "best guess", you can also turn this feature off or alternatively, explicitly tell FX Equation which variables to recognise as vectors.

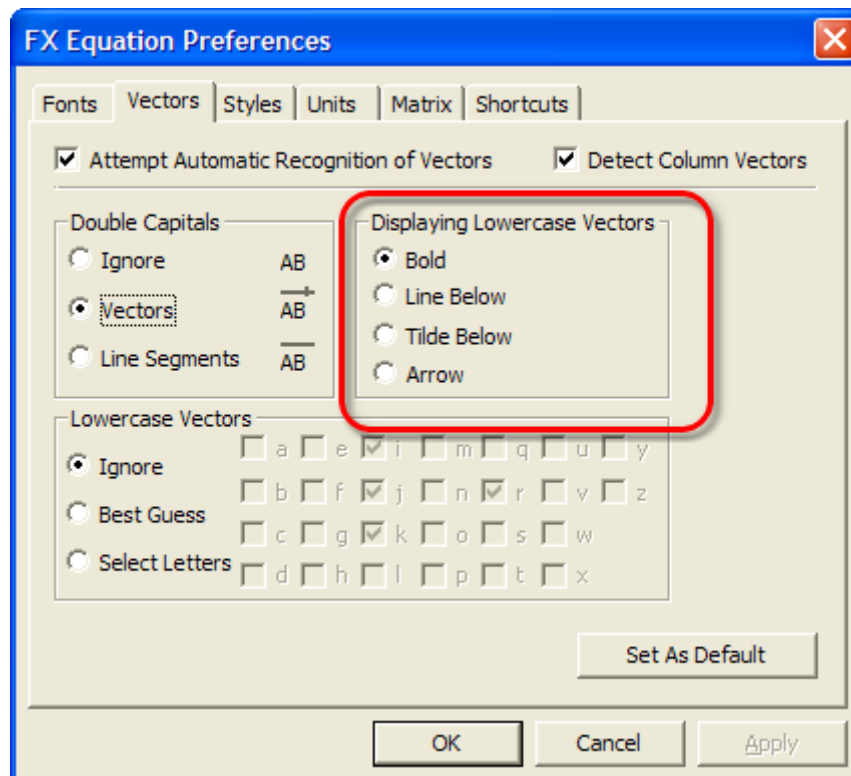


It is important to remember that you do not need to tell FX Equation that you are working with a vector, FX Equation will automatically identify this.

Example:

$r = (3i + 2j + k) + \lambda(i - j + 3k)$ is entered as `r=(3i+2j+k)+la(i-j+3k)`

Lowercase vectors can be display bold, with an arrow over the top or with a line or tilde underneath the vector.



5.18.2.2 Double Capitals

FX Equation will only detect Double Capital vectors if automatic recognition is switched on.

Double capital letters are used to represent line segments, rays and vectors. FX Equation can automatically place an annotation over double capitals. You would use this feature if you were, for example, entering a lot of position vectors in an exam.

Examples:

$$\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA}$$

is entered as AB = OB - OA

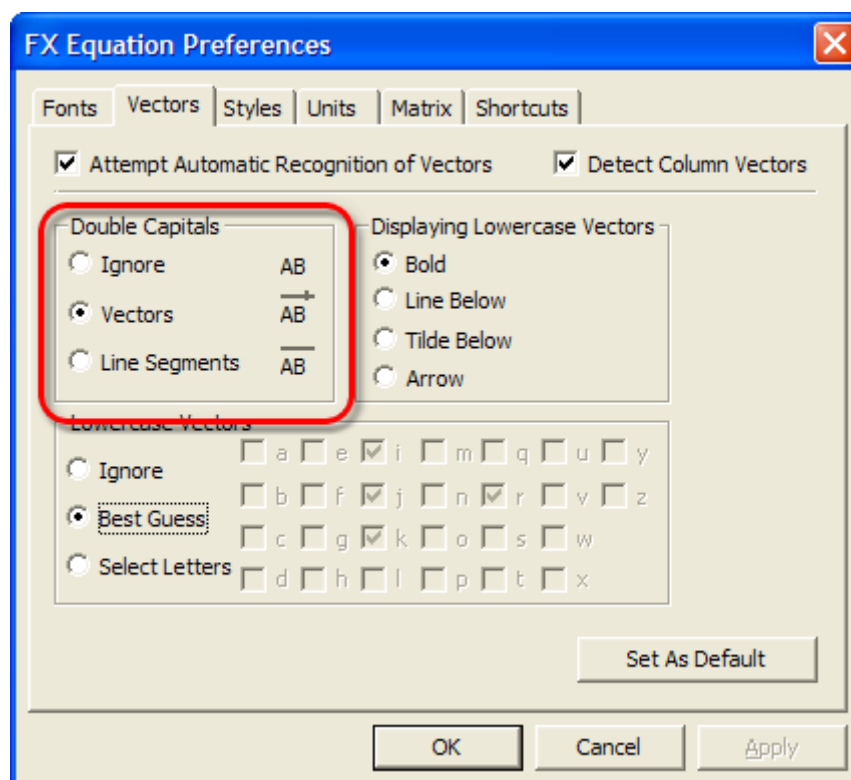
$$|\overrightarrow{OA}| = \sqrt{9 + 16}$$

is entered as |OA|=sr(9+16)

$$\cos \theta = \frac{\overrightarrow{AB} \cdot \overrightarrow{BC}}{|\overrightarrow{AB}| |\overrightarrow{BC}|}$$

is entered as cos th = (AB.BC)/(|AB | |BC|)

The annotation used by FX Equation can be set using the Vector Options



5.19 Matrices

Examples:

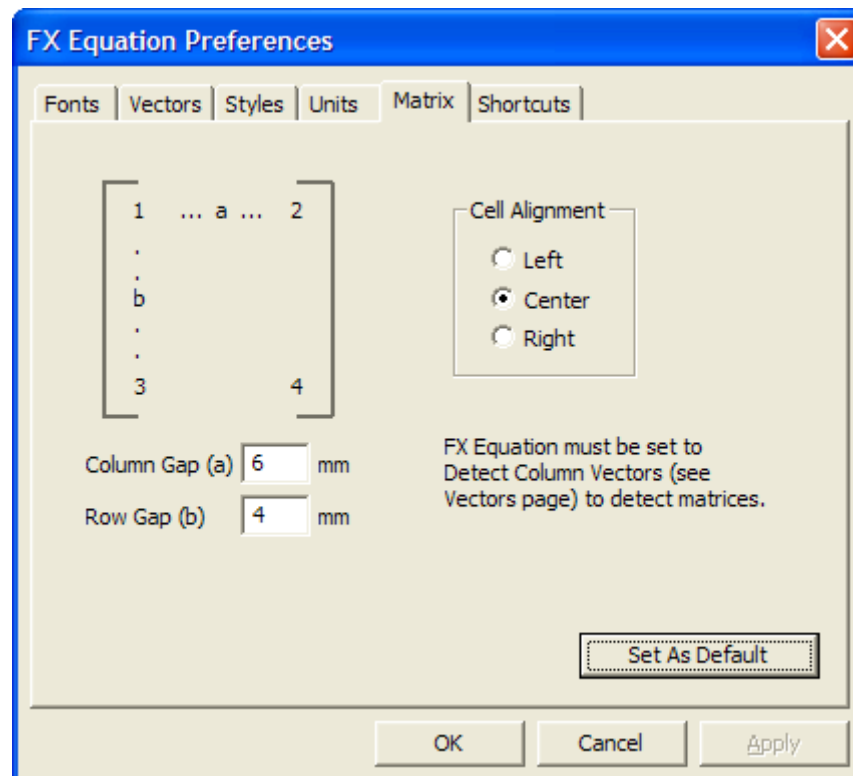
$$\begin{bmatrix} 2 & 4 \\ 3 & 6 \end{bmatrix}$$

is entered as **[2,3 4,6]**

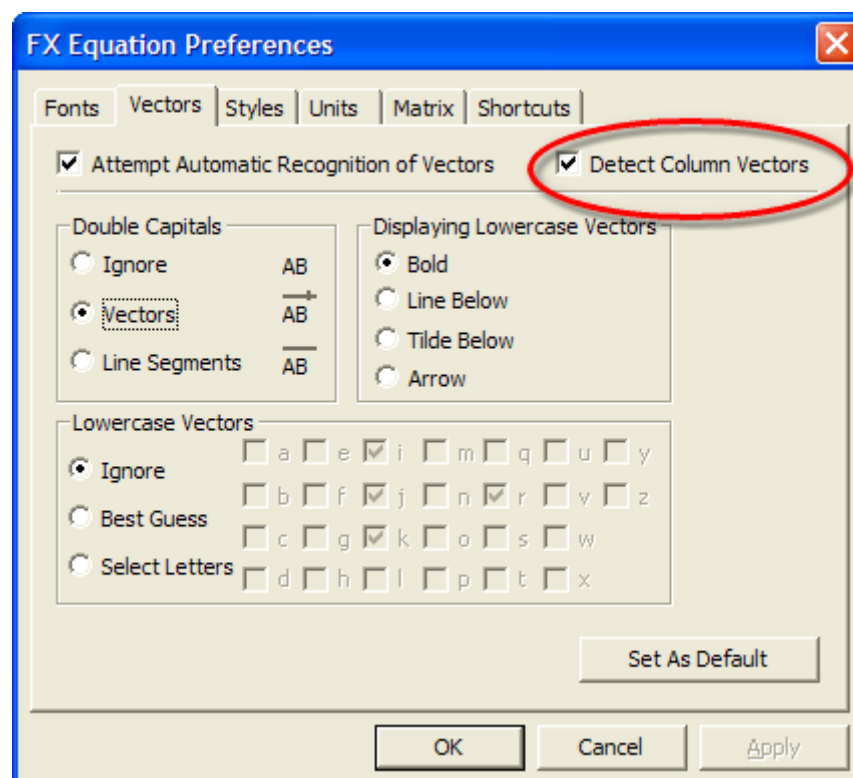
$$\begin{bmatrix} 1 & 4 & 7a \\ 2 & -5 & 8 \\ 3 & 6 & \frac{1}{2} \end{bmatrix}$$

is entered as **[1,2,3 4,-5,6 7a,8,1/2]**

You can adjust vertical and horizontal spacing for your matrices as well as alignment.



FX Equation MUST be set to detect column vectors in order to detect matrices.



5.20 Complex Numbers

FX Equation correctly formats complex numbers without any extra input on your part and recognises cis, arg and mod.

5.21 Means and Complements

A character can have a line added above it by typing an underscore _ directly after the character. **Only one character can be modified in this way.** This can be used to show means and complements.

Example:

\overline{x} is entered as x_

5.22 Predictions

Statistical predictions ("y hat") are entered using a DOUBLE power symbol.

Example:

\hat{y} is entered as y^^

5.23 Dots

A character can have a dot or two dots added above it by typing a colon or two colons directly after the character. **Only one character can be modified in this way.**

Example:

\dot{r} is entered as r :

\ddot{x} is entered as x ::

0.2 $\dot{3}$ is entered as 0.23 :

5.24 Preventing Formatting

On occasions you will want to prevent FX Equation from formatting a section of an equation. Usually this will be if you want some text in an equation. Surrounding the text in quotes will prevent it being formatted.

Example:

$x = 3 \text{ and } y = 4$ is entered as x = 3 "and" y = 4

5.25 Spaces

Spaces change the way a particular equation is interpreted and therefore formatted. This can best be illustrated using these examples.

$$\sin^2 \theta$$

is entered as **sin2 th**

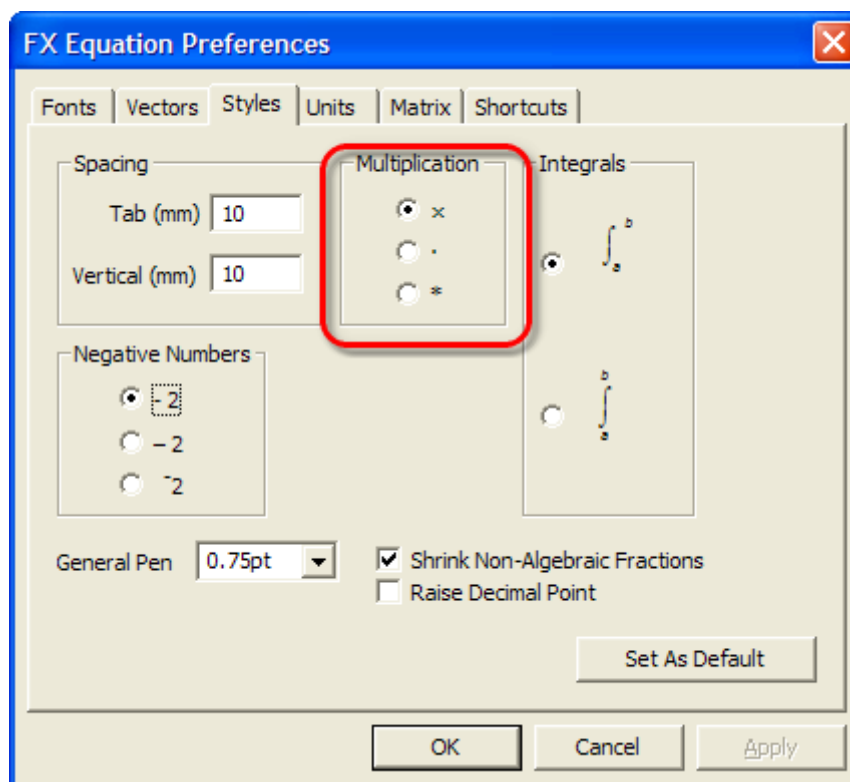
$$\sin 2\theta$$

is entered as **sin 2th**

The only difference between the two equations is the **location of a space**. Spaces can be used to add space between characters but they can also be used to indicate a change of mode

5.26 Multiplication Sign

When using FX Equation, you enter a multiplication sign using the * key. FX Equation can display your sign in one of three ways.

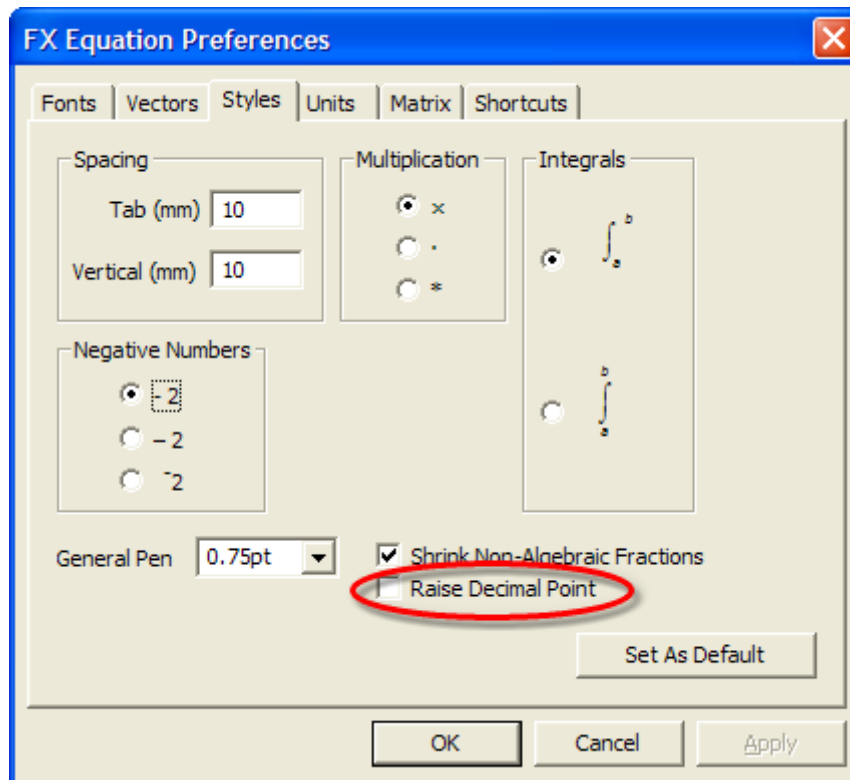


FX Equation will display any entered multiplication sign AND the multiplication sign in scientific notation.

5.27 Raising The Decimal Point

Some locations prefer that the decimal point is raised.

ie. $3\cdot2$ rather than 3.2



This option will only take effect if you use a dot as a decimal point.

5.28 Recognized Functions

FX Equation automatically recognises functions and formats them differently, according to your preferences. The functions that FX Equation recognises are:

sin	asin	sec	sinh
cos	acos	cosec	cosh
tan	atan	cot	tanh
ln	log	abs	arg
normal	cis	mod	

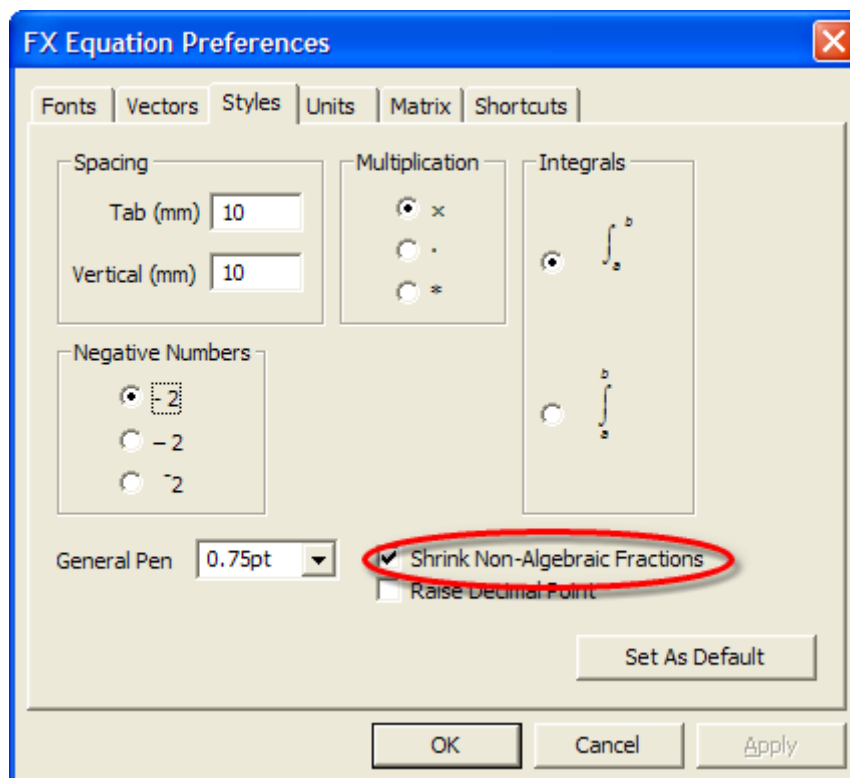
5.29 Mixed Numerals

Mixed Numerals are created automatically if you have selected the Shrink Non-Algebraic Fractions option.

$$3\frac{1}{2}$$

is entered as 3 1/2

The Shrink Non-Algebraic Fractions option is available in the Styles page of FX Equation's options.



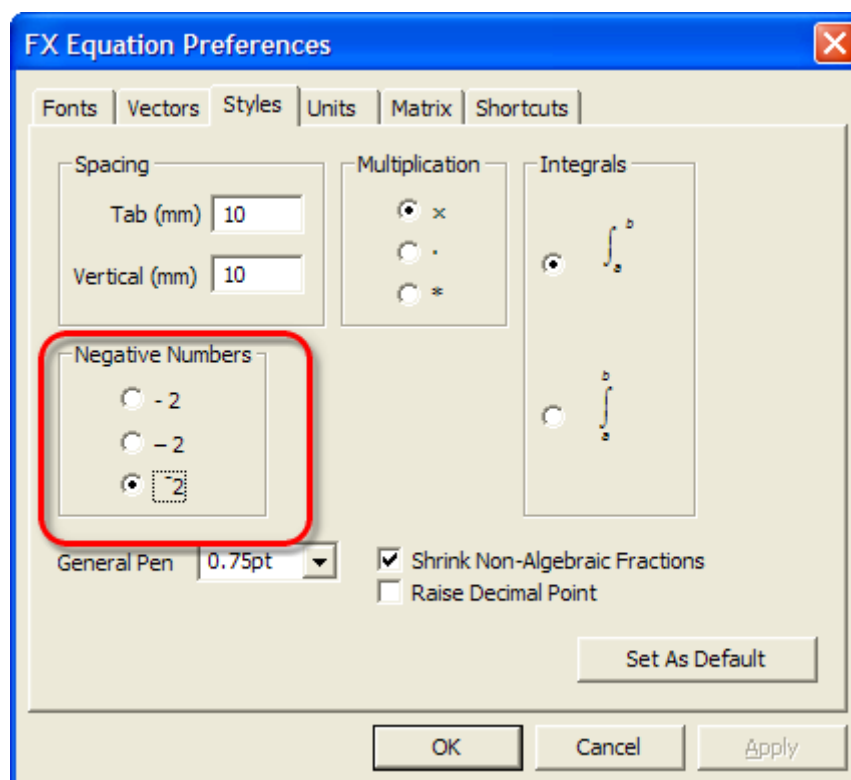
5.30 Negative Numbers

FX Equation will detect most negative numbers. For example, if you type

$$-9 - 3$$

FX Equation will detect that the first and third - signs are indicating negation whereas the middle - is indicating subtraction.

FX Equation offers you the option to display negative numbers differently.



The three options produce these results.

$$-9 - -2$$

$$-9 - -2$$

$$-9 - -2$$

5.31 Recurring Decimals

Entered using the : key and the _ key.

$$2.\dot{4}$$

is entered as 2.4:

$$2.\overline{4}$$

is entered as 2.4_

$$2.1\overline{234}$$

is entered as 2.1_234

5.32 Greatest Integer

Greatest Integer signs are entered as [| and |]

Example:

$$\left[x^2 + 3x - 1 \right]$$

is entered as `[x2+3x-1]`

5.33 Definite Integral Bounds

FX Equation supports a special notation to show the bounds of a definite integral.

For example.

If you wish to calculate this definite integral

$$\int_1^2 x^2 dx$$

You might need to enter this intermediate line in your calculations.

$$= \left[\frac{x^3}{3} \right]_1^2$$

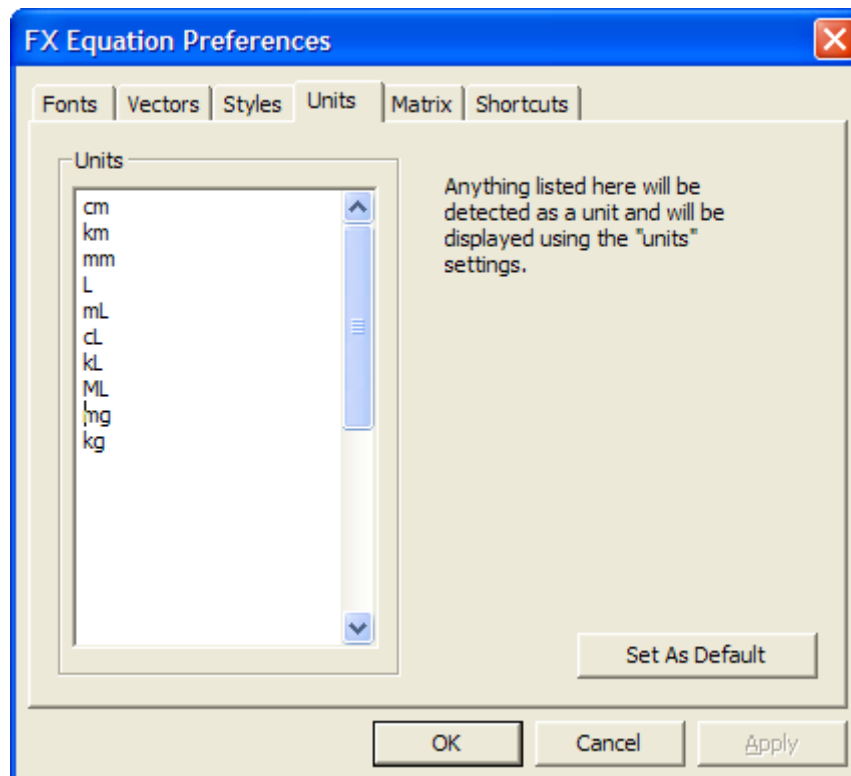
You can enter these bounds as `[x3/3]1,2`

5.34 Displaying Units

FX Equation can detect units and display them using different settings. This allows you to clearly delineate things such as

$$x \text{ cm}$$

All you need to do to use this feature is to tell FX Equation what to consider a unit.



These units are our suggestions. You can set the units to whatever you require - and change them on an equation by equation basis.

Note for Advanced Users.

Single letter, lower case units (eg s, g, h, and m) are usually best left off this list. Putting them on the list causes FX Equation to behave counter-intuitively, although totally logically.

For example...

$$\frac{f(x + h) - f(x)}{h}$$

The h has been formatted using the units formatting but not the way the user was expecting.

5.35 Logarithms

Normally, numbers written immediately after a function are raised as a power automatically.

Example:

$$\cos^2 x$$

is entered as cos2 x

log is treated differently. Entering log2 x will generate.

$$\log_2 x$$

This makes generation of logarithms automatic.

5.36 Piecewise Defined Functions

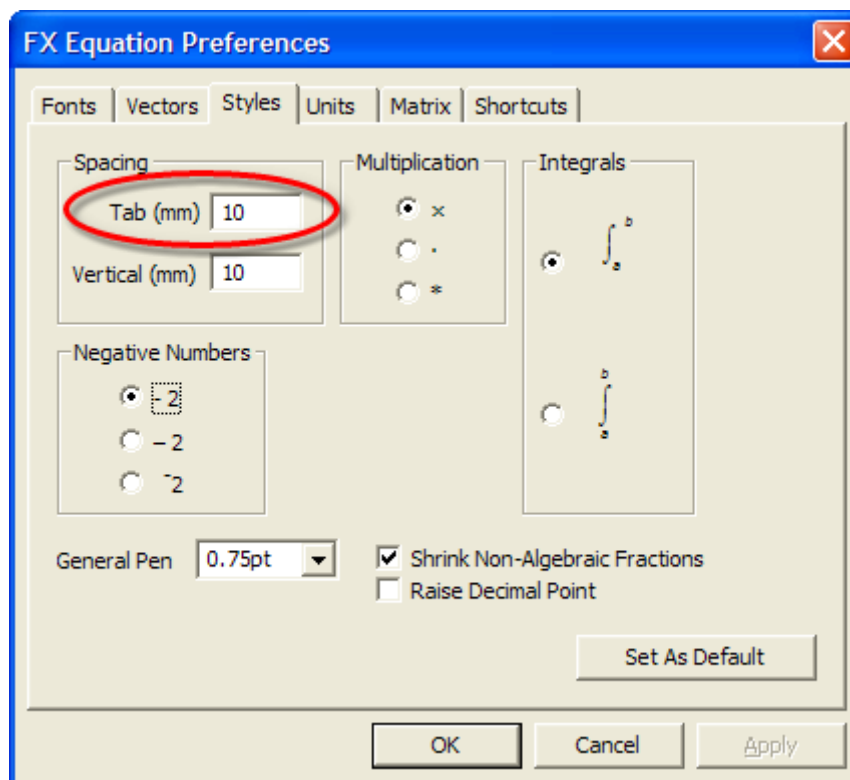
FX Equation's matrix feature can be used to enter piecewise defined functions.

$$y = \begin{cases} x^2 & : x < -2 \\ 3x & : -2 \leq x < 4 \\ 0 & : x = 4 \\ 5x^2 + 1 & : x > 4 \end{cases}$$

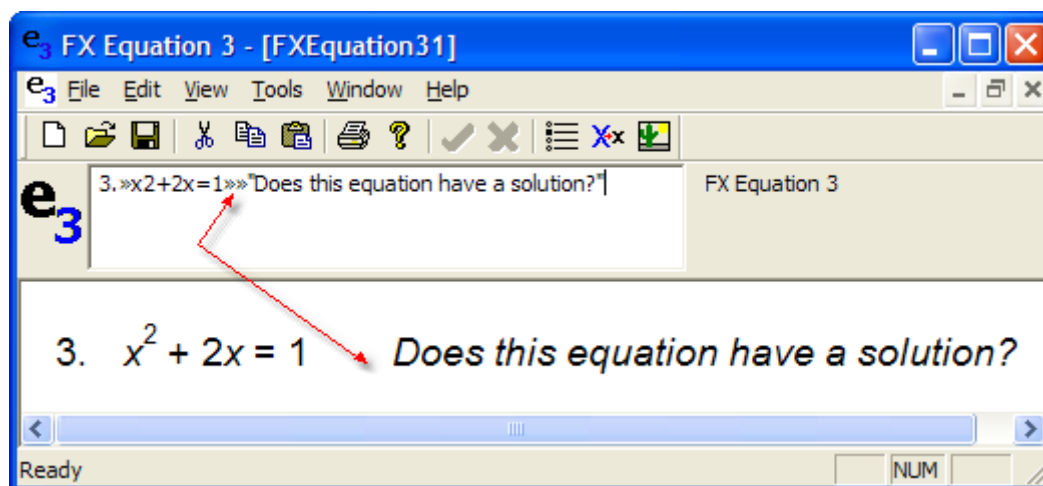
(x<-2),(-2<=x<4),(x=4),(x>4) is entered as y={x2,3x,0,(5x2+1) :, :, :, :

5.37 Tabs

Tabs are set to 10mm by default in FX Equation but you can change them at any time using the Style tab on the options screen.



when entering tabs into your equation, they are displayed as » in the equation entry area.



5.38 Multiline Equations

Up to twenty lines of equations can be entered at one time. Simply push the down arrow or Enter Key to access the next line when using the main input screen.

5.39 Vertical Spacing

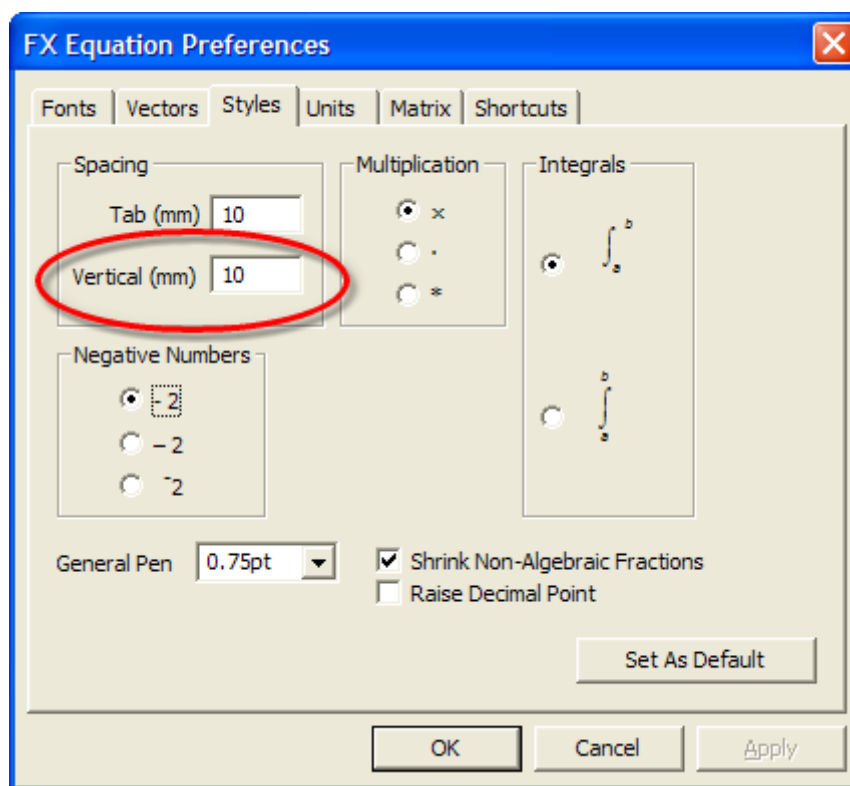
Vertical spacing is the spacing between successive lines in a multiline equation.

$$y = 3x^2 + \frac{2x}{5}$$

↕ 10 mm

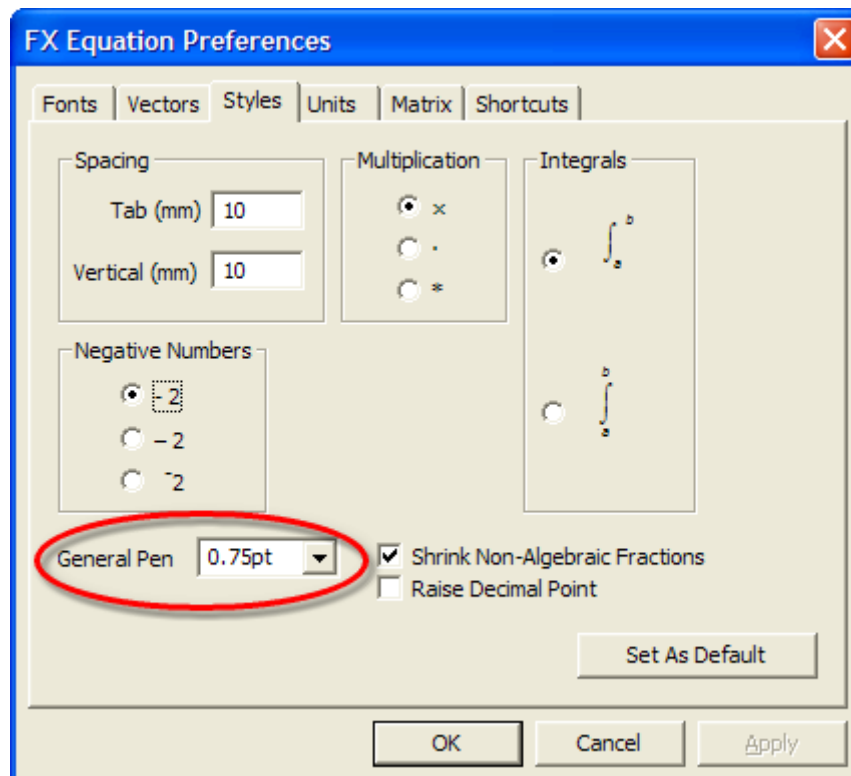
$$y = 3x^2 - \frac{5x}{2}$$

You can set the vertical spacing using the Styles tab.



5.40 Lines

FX Equation draws lines for fractions and root signs. You can set the width of the line using the General Pen setting.



All lines will be drawn using the main font colour.

5.41 Shortcuts

Shortcuts allow you to quickly add common equations to your documents. The quadratic function for example.

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

To enter the quadratic function in FX Equation, you would normally type

$$x=(-b+-sr(b^2-4ac))/2a$$

to generate this equation. Shortcuts allow you to enter it by typing **qf**

We have entered some shortcuts for you to get started.

	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
qf	
pv7	3.1415927
pv20	3.14159265358979323846

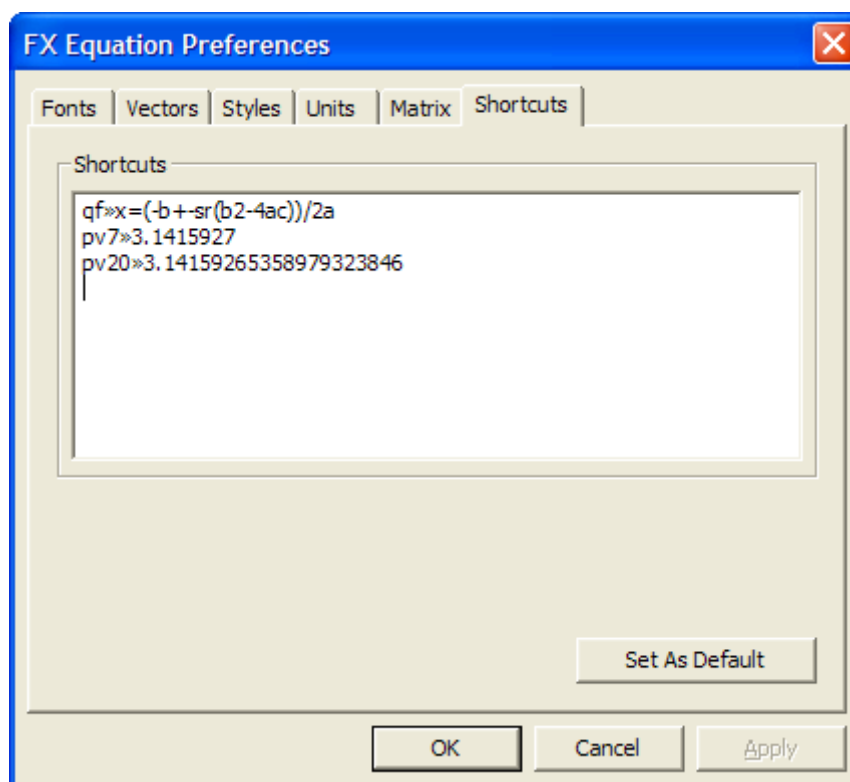
but you can edit our shortcuts or create your own to suit your workstyle.

Editing Shortcuts

Push the Edit Options toolbar button or choose Edit Options from the Tools menu.



Push the Shortcut tab



Each shortcut is on a separate line. To edit a shortcut, just move the cursor into the shortcut and start typing. To create a new shortcut, move the cursor to the bottom of the list and start typing.

Shortcuts are formatted as

The code - followed by the tab key - followed by the desired output

eg

qf»x=(-b+-sr(b2-4ac))/2a

The **qf** is the code

The **»** is produced by pushing the tab key

The **x=(-b+-sr(b2-4ac))/2a** is the desired output.

Important

Shortcuts will only be saved if you push the **Set As Default** button

5.42 International Considerations

FX Equation automatically detects the symbol you use as a decimal point - either . or ,

If you use . as a decimal point (eg 3.2), you will use , as a separator for entering vectors or matrices.

$$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

is entered as (3,2)


If you use , as a decimal point (eg 3,2), you will use ; as a separator for entering vectors or matrices

$$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

is entered as (3;2)

5.43 Quickly Formatting Equations

FX Equation 3 introduces a "Reset Equation" option which quickly resets your equation back to the current default.

You can access this function by pushing the Reset Equation button  or by choosing Reset Equation from the Tools menu.

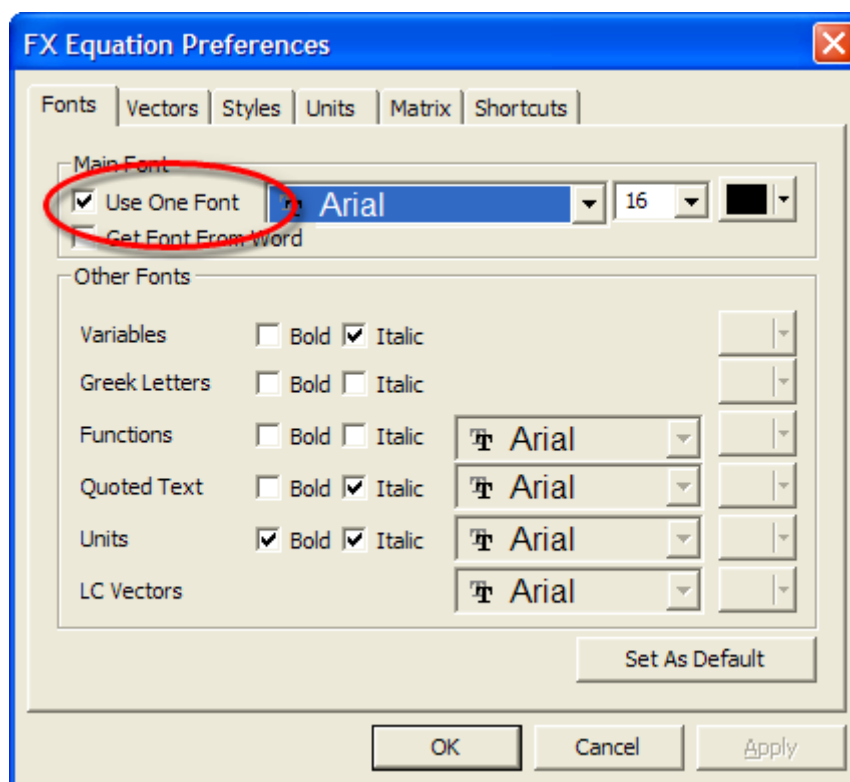
You can use this function to change a large number of equations to a default.

1. Open the document.
2. Edit the first equation in the document and change its formatting to your desired format. Push the Set As Default button as you change options on each screen.
3. Close the first equation.
4. Open each equation in turn and push the Reset Equation button.

5.44 Fonts & Colours

FX Equation 3 can use a wide variety of fonts and colours when formatting your equations.

FX Equation can run in two modes, it can use one font and colour for everything or it can use different fonts and colours for each different component of your equations. You can select the mode using this option.



Your font settings will be overridden if you select the Get Font From Word option. See next topic.

Notes for Advanced Users.

Italic fonts can cause problems in equations. This is because most fonts do NOT have a "defined" italic style. Windows will "italicise" a font for you by applying a shear transformation to the base font. Unfortunately this transformation confuses Window's sizing routines and makes accurate placement of components difficult.

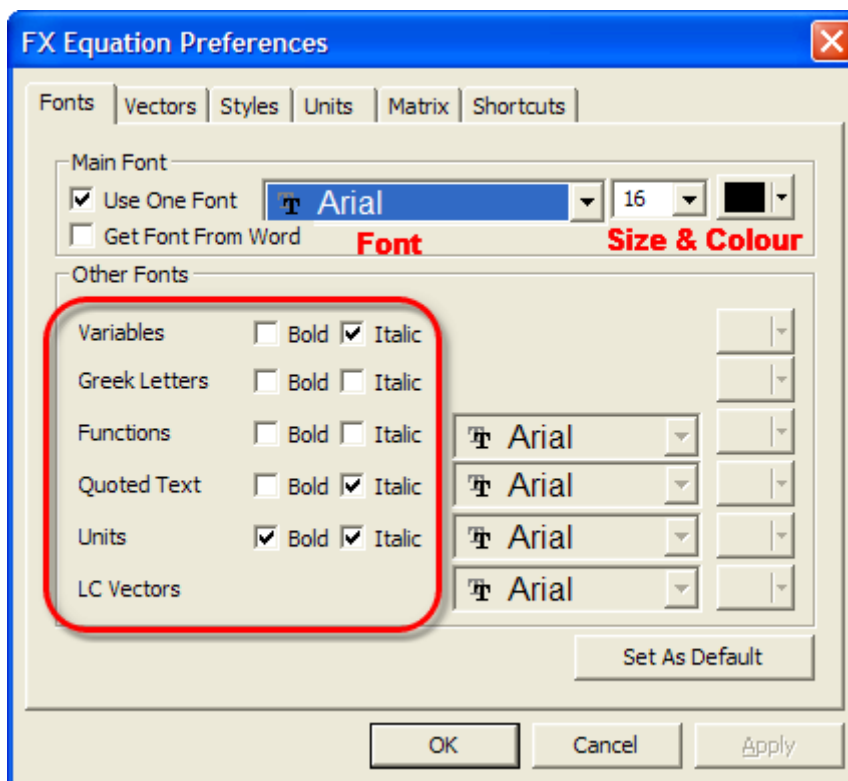
Using an italic font for small components of an equation (eg variables) is fine. Using an italic font for large components (eg quoted text) can cause spacing issues.

The best way to avoid problems is:

- Use standard fonts for most equations or components of equations. Times New Roman and Arial are the best supported fonts in Windows.
- Consider NOT italicising quoted text.

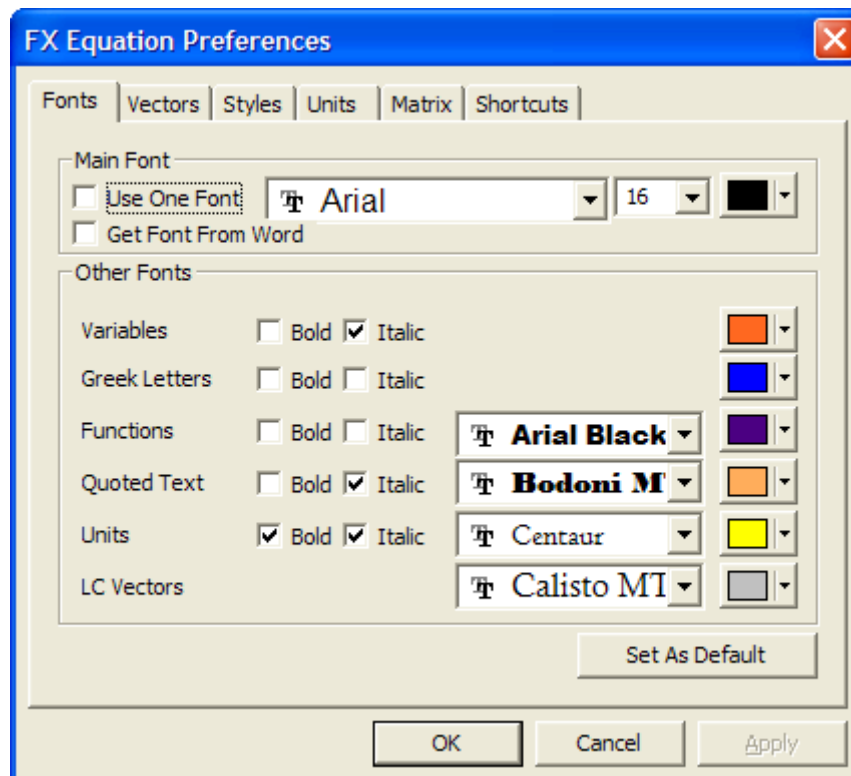
5.44.1 Using One Font & Colour

All components of your equation will be drawn using your selected font - but you can still choose to make different components bold or italic.



5.44.2 Using Multiple Fonts & Colours

All the different components of your equation can have a different font and colour - in addition to bold and italic settings. Variables will always be drawn with the main font.



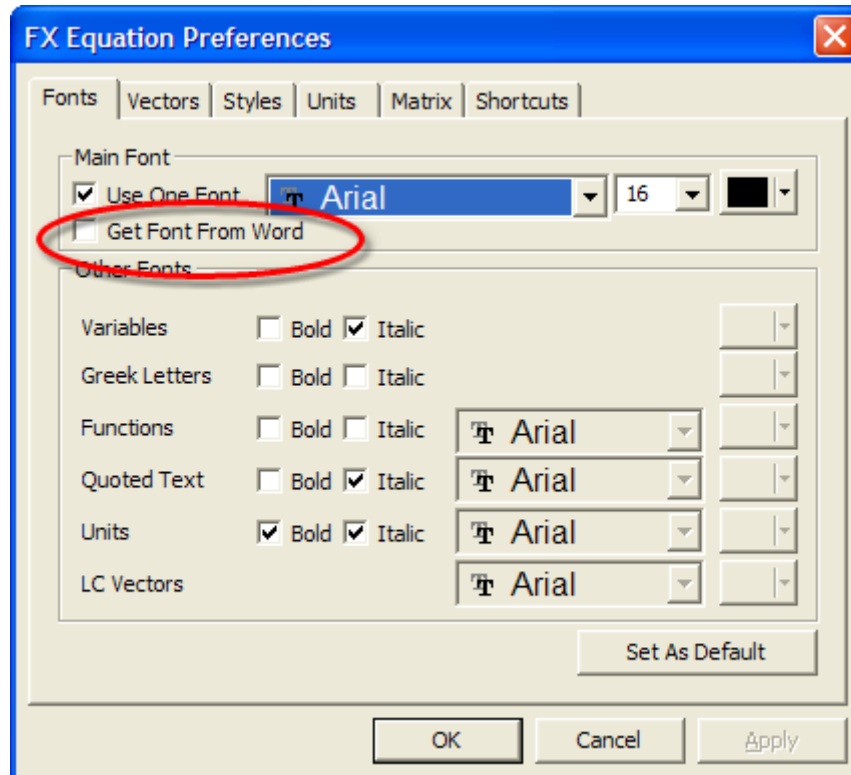
$$3x + 2\theta = \sin^2 x^2 \text{ Quoted text } \cap 3\text{cm}$$

5.45 Getting Font Information From Word

FX Equation can use its own fonts, or it can use the currently selected font in Word, when creating a new equation.

If you use this option and you are typing in a Word document where the text is in Times New Roman 12 pt, any equation you create will be in Times New Roman 12pt as well.

Please note that FX Equation can only use Word's font information when it first **creates** the equation. If you change Word's font later on, your equations will NOT automatically change.



5.46 Set As Default

FX Equation keeps a "default" set of options for equations. It uses these default options whenever it creates a new equation. Once an equation is created, you can change that equation's options to suit your needs. Changing an equation's options does NOT change the default options.

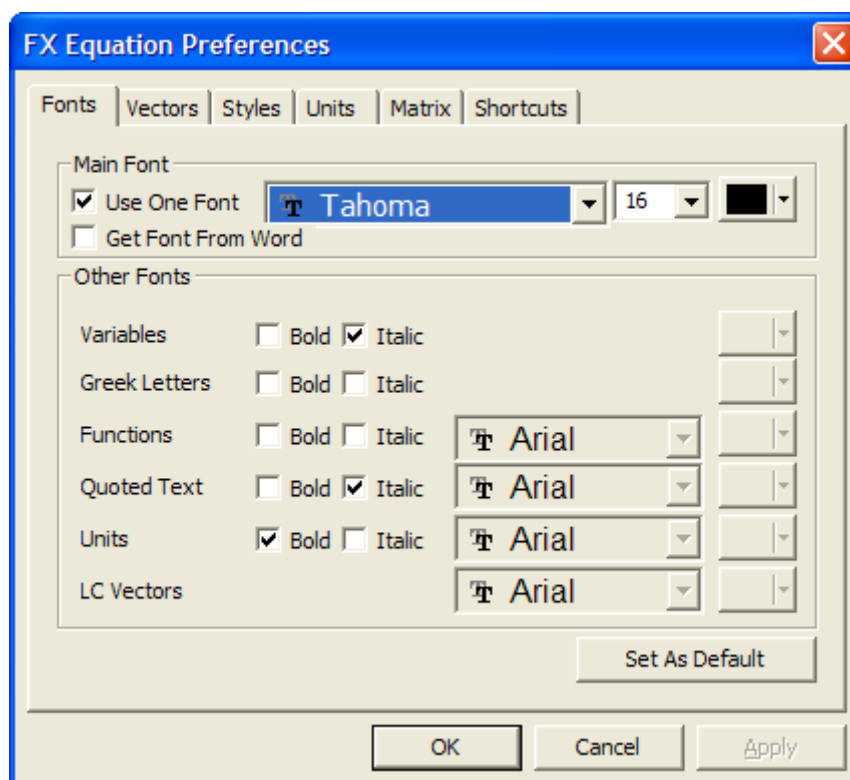
If you have a option that you ALWAYS change, it is much quicker to make your setting part of the default options. This is very easy to do.

- Create a new equation - it will be formatted with the default options.
- Change the desired option.
- Push the Set as Default button - your desired option will become the new default.

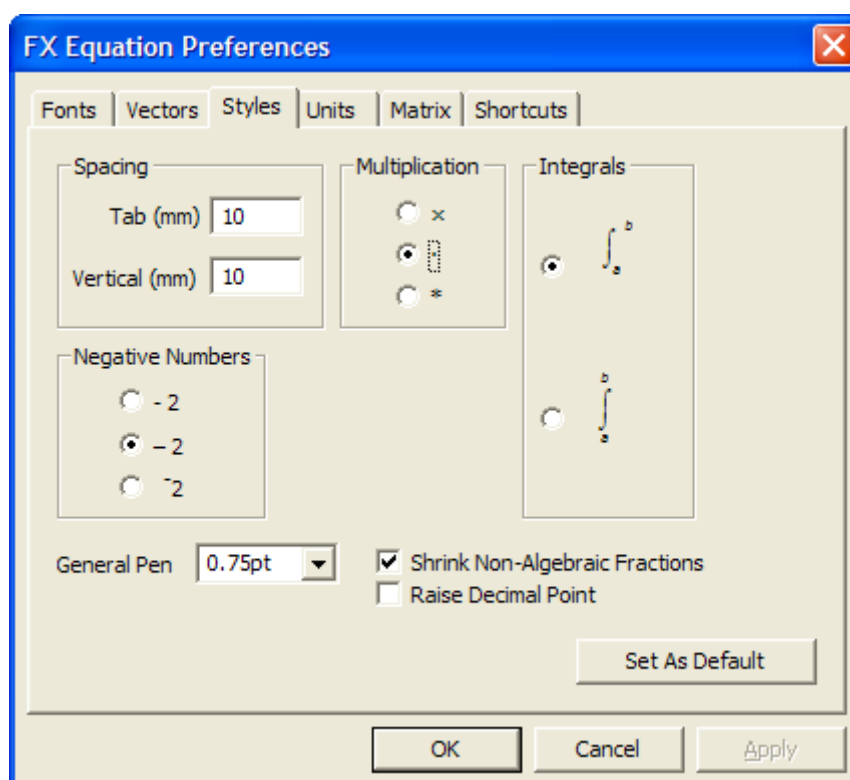
Notes for Advanced Users

- The Set as Default buttons only affect the current options screen. If you make changes on multiple screens, you must push the Set As Default button on **each** screen.

For example:



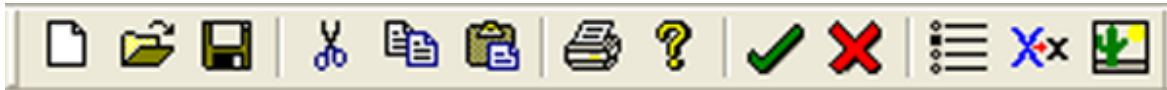
I've changed the default font to Tahoma - push the Set As Default button.



I've changed the multiplication style to a dot - push the Set As Default button because this option is on a different screen.

- Defaults are stored in the user's private profile. Every user gets to set their own options and defaults.

5.47 The Toolbar



Most of the buttons will be familiar to you but the last five are new to FX Equation 3



This button will return you to Word and update the equation in Word. You can achieve the same thing using Ctrl + R or Ctrl + Shift + E



This button will return you to Word without saving any changes



Edit an equation's options. There are many more options for equations now and it is worthwhile taking a look through these.



Reset this equation to current defaults. This allows you to quickly reset an equation to your current defaults. If, for example, you have a lot of equations in 10pt Times New Roman but you prefer 12 pt Arial, you can set your FX Equation default to 12 pt Arial and press this button after opening the equation. All the settings are updated.



Put a copy of the equation on the clipboard as a Windows Metafile. This allows you to use FX Equation to get equations into programs that do not support "Insert Object".

5.48 The Menus

5.48.1 Edit Menu

The Edit Menu contains two extra options

Copy As Metafile	Ctrl+M
Copy As Bitmap	Ctrl+B


These two options allow you to get FX Equation equations into programs other than Word.

For more information on Metafiles and Bitmaps


Using FX Equation to Create Vector Graphics
Using FX Equation to Create Bitmaps

5.48.2 Tools Menu

Edit Options...

This opens the options screen and allows you to change options in FX Equation. It is equivalent to pushing the  button

Reset Equation

This resets all the options for the equation back to the current default values. It is equivalent to pushing the  button. For more information on this feature, look at

Quickly Formatting Equations

Write Default Configuration File

Writes a file to your hard drive that permits automatic registration and configuration in network situations. For more information on this feature, look at

Automatic Registration and Configuration (Advanced)

Reset Options

Resets all options to their original default settings.

5.48.3 Help Menu

The Help menu gives you access to reference materials for FX Equation, information about your version of FX Equation, information about Efofex and lets you register your copy of FX Equation.

Read Help File (F1)

Read Manual (PDF)

These two options present **exactly** the same information (**this** information) in two different formats. The Manual is offered in PDF format and requires a copy of Adobe Acrobat to view.

Read Quick Ref Card (PDF)

The Quick Reference card is a simple two page "cheat sheet" showing all of the codes and techniques to get the most out of FX Equation. This is the ideal sheet to print, laminate and keep next to your computer.

Read What's New Card (PDF)

If you are familiar with FX Equation 2, this card lists all of the major changes and improvements that FX Equation 3 provides.

About FX Equation 3

Provides exact version information for FX Equation. We will often ask you to check exactly which version of FX Equation you are using if you contact us with a question. A full version number will be a number with three decimal places (eg 3.021)

About Efofex

Contact details for Efofex

Register FX Equation 3

Go here to register your copy of FX Equation and keep it working past the 30 day evaluation period. For more information on registering your copy, look at

Registration

5.49 Using FX Equation With Programs Other Than Word

FX Equation is designed specifically to integrate with Word but it can be used with other programs in one of three ways.

5.49.1 Inserting FX Equation as an OLE Object

Some programs support OLE and can load FX Equation this way. OLE stands for Object Linking & Embedding and it is the technology that allows you to double click on an FX Equation equation and edit it. It is the technology we use to integrate FX Equation into Word. To see if your program supports OLE, look for Insert Object in the menus and pick FX Equation 3 from the list of available objects.

Advantages

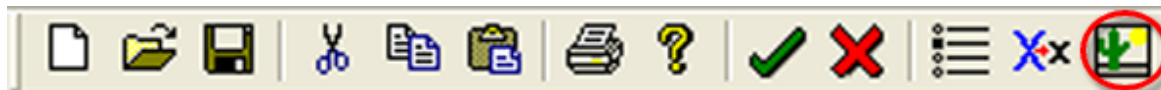
You can edit your equation later.
Equations will be crisp and clear on any device.
Equations can be resized without loss of clarity.

Disadvantages

Not all programs fully support OLE and may get confused with the FX Equation object. Many programs do not support OLE at all and you will simply not have the option.

5.49.2 Using FX Equation to Create Vector Graphics

Windows has a file format (called Windows Metafiles or WMF) that provides programs with a list of instructions describing how to draw the equation. You can place a WMF version of your equation onto the clipboard by either typing Ctrl+M or by pushing the Picture button on the toolbar.



Advantages

Equations will be crisp and clear on any device.
Equations can be resized without loss of clarity.

Disadvantages

Equations cannot be edited later. Think of WMF as a one-way street.
Not all programs support WMF data.
WMF does not provide perfect results in all situations. Sometimes the equation will appear incorrectly.

5.49.3 Using FX Equation to Create Bitmaps

Bitmaps are just a great big list of dots and their colours. They are supported by just about every program that uses graphics.

Advantages

Bitmaps are supported by EVERYTHING.
The equation will always be displayed in same way. No surprises.

Disadvantages

Equations cannot be edited later. Think of bitmaps as a one-way street.
Resizing equations will cause loss of clarity.
Displaying equations on high resolution devices (eg printers) will make the equations look "jaggy"

5.50 Complex Equations

FX Equation has only one limit on the complexity of the equations you can enter.

Matrices are limited to 20 by 20.

Because of the complexity of interpreting your entry, FX Equation will gradually slow as you enter a more complex equation but this will rarely impact on your use

of FX Equation.

$$\frac{\sqrt{3\sin^2\theta x^2}}{\left(\frac{x^{y^{z+\frac{1}{x}}}}{\sqrt{\frac{1}{\int_{-\frac{1}{2}}^{\pi} x^2 dx + \frac{1}{x^{\frac{1}{2}}}}}} + \lim_{x \rightarrow y} \times \sum_{i=1}^{10} \frac{x_i}{i} \right)^{\frac{1}{3}}}$$

In all likelihood, you will run out of steam before FX Equation! Please note that the equation above is NOT meant to make any sense.

5.51 My Equation is Not Formatted Correctly!

FX Equation makes its best attempt to interpret what the user has typed in a logical way. We have aimed to produce an equation editor that **automatically** formats nearly 100% of the equations a typical secondary teacher would need to produce. If your equation happens to be too ambiguous for FX Equation to handle, you may have to use one of the other tools available. We have not tried to replace these complex and highly versatile tools. We have simply tried to automate the most common equations.

6 Hints & Tips

6.1 Does FX Equation Balance Brackets?

No. FX Equation makes no attempt to examine the logical consistency of your brackets. It even treats the three types of brackets, ({ [as being equivalent. It is up to you to ensure that what you type is logical.

6.2 Why Are Spaces So Important?

FX Equation attempts to automatically format most equations. Unfortunately many expressions are ambiguous, $\sin 2x$ for example. We wanted FX Equation to automatically recognize $\sin^2 x$ while still allowing you to get $\sin 2x$ if you wish. The solution was where you put a space. If you leave a space between \sin and $2x$, you will get $\sin 2x$. Without the space you get $\sin^2 x$. This is much easier to use than describe. In general, if FX Equation does not format your equation the way you expect, try entering a space between things.

6.3 How Do I Enter An Ordered Pair?

It is amazing how often we are asked this question. People quickly realize that typing an ordered pair into FX Equation produces a vector and they want to know what to do if they REALLY want an ordered pair. The answer is obviously to not use FX Equation and just type your ordered pair into your word processor OR use quotes to prevent FX Equation from formatting your equation.

6.4 How Do I Stop FX Equation From Formatting Something?

This question most often occurs when someone is trying to type a word such as "and" or "there" and FX Equation insists on formatting it into \cap or θ ere. By enclosing a section of your equation in quotes ("and" and "there") you prevent FX Equation from formatting that part of the equation.

6.5 How Do I Enter A Matrix?

Matrices are entered column by column. It is advisable to add a few spaces between the columns.

[1,2,3 4,5,6 7,8,9 :, :, : a,b,c]

$$\begin{bmatrix} 1 & 4 & 7 & : & a \\ 2 & 5 & 8 & : & b \\ 3 & 6 & 9 & : & c \end{bmatrix}$$

6.6 How Do I Enter a Degrees Sign?

Degrees signs are entered with the ` key. This is normally the key NEXT to the 1 key and it normally produces a ~ when pressed whilst holding down the Shift key. Alternatively you can enter the degrees sign using the lowercase o.

The ` key is a backwards single quote. It is not the normal ' key (next to semicolon).

6.7 Can you help me get my equations at the right level?

Getting your equations to line up with a line of text in Word is not as easy as it should be. We acknowledge this and are constantly working to improve the situation. This has proved to be a difficult exercise due to a lack of information from Microsoft.

In general, six issues can affect the alignment of your equations. They are:

1. Not using the supplied macros
2. A little quirk in Word.

3. Not waiting long enough.
4. Changing the Vertical Size After Creation – The Adjust Level Button

6.7.1 Macros

Firstly, some important information about FX Equation. FX Equation does NOT align equations to line up correctly. All it does is provide Word with a box containing the equation and Word is responsible for lining it up. This is why "Insert Object" does not, and will never, line the equations up. Word is never being given any instructions on how to align the equation.

Because FX Equation does not line up the equations, we have provided macros for Word that will do the job for you. These macros are normally copied to the appropriate directories during setup. The installation notes contain more information about putting these macros in the correct location.

It is this macro that you are calling by pressing the toolbar button.

6.7.2 The Little Quirk in Word

When an FX Equation equation is inserted, it is inserted as a space, then the equation, then another space.

Normal text <space> $x^2 + 7x$ <space> Normal text

The equation between the two spaces is lowered to line up with where the text is.

Normal text <space> $x^2 + 7x$ <space> Normal text

Why the spaces? Because of a little quirk in Word. If you manage to get your cursor in between the equation and the space, any text you type will be lowered (quite dramatically). This looks something like this

Normal text <space> $x^2 + 7x$ **New Text** <space> Normal text

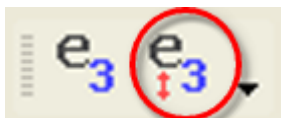
Unfortunately, compared to the next text, the equations look as if they need to be lowered. Our macros set the text colour for this new text to bright red to make sure that you realise that you are in the wrong spot. If you see red, **STOP** and move the cursor to the other side of the space.

The best way to understand this behaviour is to have a bit of a play around with it. Try typing on either side of the space to get a feel for what is going on. We have found that customers do not have a problem with it once they understand it.

6.7.3 Not Waiting Long Enough

FX Equation only sets the level of the equation when you first create it. As you are creating the equation, FX Equation adjusts its level but it is possible to make a change to an equation and exit FX Equation BEFORE the it has had a chance to adjust the level.

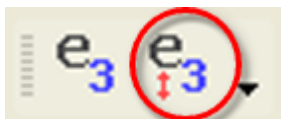
If this occurs, just push the Adjust Level button (the right hand one).



6.7.4 Changing the Vertical Size After Creation - The Adjust Level Button

The supplied macros only adjust the level of the equation automatically WHEN THE EQUATION IS BEING CREATED. If you go back later and change the vertical size of an equation, the automatic macros will NOT be running and will NOT adjust the level automatically.

So what do you do? You use the OTHER FX Equation button - the adjust level button.



This button can be used at any time. To adjust an equation that is at the incorrect level:

1. Double click and enter the equation
2. Exit the equation. This stores a lowering "hint" for that equation
3. Make sure that the equation is selected.
4. Push the Adjust Level button. This will use the hint to get the lowering correct.

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