



Math Guide

Using the Equation Editor



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Note for Mac users

Some keystrokes and menu items are different on a Mac from those used in Windows and Linux. The table below gives some common substitutions for the instructions in this chapter. For a more detailed list, see the application Help.

<i>Windows or Linux</i>	<i>Mac equivalent</i>	<i>Effect</i>
Tools > Options menu selection	OpenOffice.org > Preferences	Access setup options
<i>Right-click</i>	<i>Control+click</i>	Opens a context menu
<i>Ctrl (Control)</i>	⌘ (<i>Command</i>)	Used with other keys
<i>F5</i>	<i>Shift+⌘+F5</i>	Opens the Navigator
<i>F11</i>	⌘+T	Opens the Styles and Formatting window

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What is Math?

Math is LibreOffice's component for writing mathematical equations. It is most commonly used as an equation editor for text documents, but it can also be used with other types of documents or stand-alone. When used inside Writer, the equation is treated as an object inside the text document.

Note

The equation editor is for writing equations in symbolic form, as in equation 1. If you want to evaluate a numeric value, see the *Calc Guide*.

$$\frac{df(x)}{dx} = \ln(x) + \tan^{-1}(x^2) \quad (1)$$

Getting started

To insert an equation, go to **Insert > Object > Formula**.

The equation editor opens at the bottom of the screen, and the floating Elements window may appear. You will also see a small box with a gray border in your document, where the formula will be displayed, as shown in Figure 1.

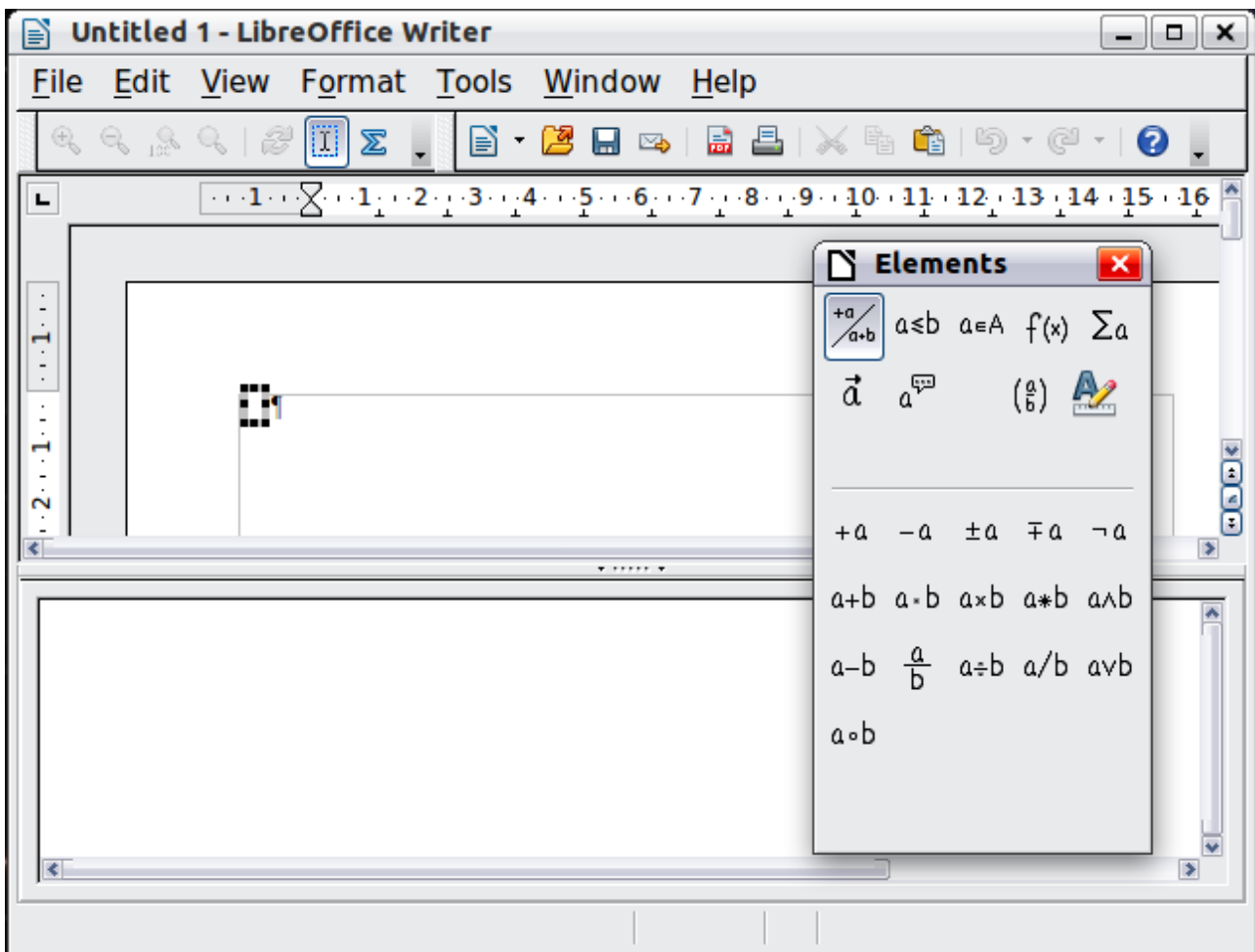


Figure 1: Equation Editor, Elements window, and location of resulting equation

Entering a formula

The equation editor uses a markup language to represent formulas. For example, `%beta` creates the Greek character beta (β). This markup is designed to read similar to English whenever possible. For example, `a over b` produces a fraction: $\frac{a}{b}$.

You can enter a formula in three ways:

- Select a symbol from the Elements window.
- Right-click on the equation editor and select the symbol from the context menu.
- Type markup in the equation editor.

The context menu and the Elements window insert the markup corresponding to a symbol. This provides a convenient way to learn the LibreOffice Math markup.

Note

Click on the document body to exit the formula editor.
Double-click on a formula to enter the formula editor again.

The Elements window

The simplest method for entering a formula is the Elements window.

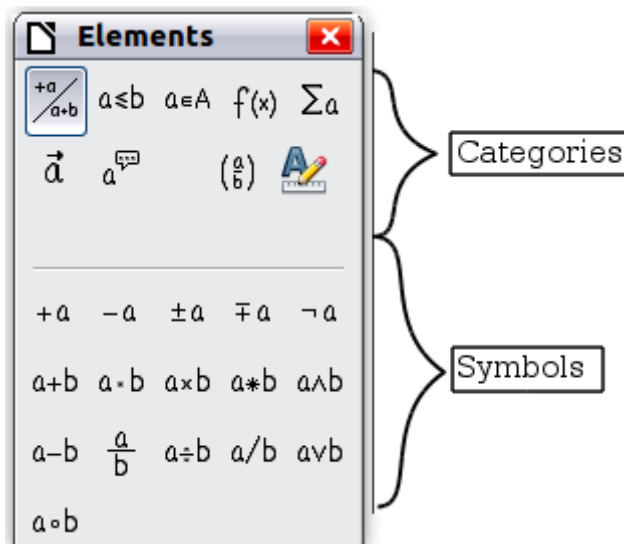


Figure 2: Symbols are divided into categories

The Elements window is divided into two main parts.

- The **top** shows the symbol categories. Click on these to change the list of symbols.
- The **bottom** shows the symbols available in the current category.

Tip

You can hide or show the Elements window with **View > Elements**.

Example 1: 5×4

For this example we will enter a simple formula: 5×4 . On the Elements window:

- 1) Select the top-left button of the categories (top) section.

2) Click on the multiplication symbol.

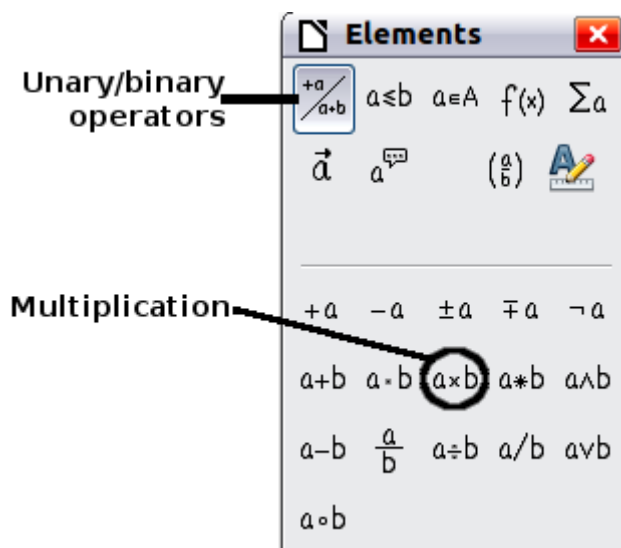


Figure 3: Selecting the multiplication symbol

When you select the multiplication symbol on the Elements window, two things happen:

- The equation editor shows the markup: $\langle ? \rangle \textit{times} \langle ? \rangle$
- The body of the document shows a gray box like this: $\square \times \square$

Figure 4: Result of selecting the multiplication symbol

The $\langle ? \rangle$ symbols shown in Figure 4 are placeholders that you can replace by other text, for example **5** and **4**. The equation will update automatically, and the result should resemble Figure 5.

Tip

To keep the equation from updating automatically, select **View > AutoUpdate display**. To update a formula manually, press **F9** or select **View > Update**.

Figure 5: Result of entering 5 and 4 next to the times operator

Right-click (context) menu

Another way to access mathematical symbols is to right-click on the equation editor. This pops up the menu shown in Figure 6. The items in this menu correspond exactly to those in the Elements window.

Figure 6: Right-click (context) menu

Markup

You can type the markup directly in the equation editor. For example, you can type **5 times 4** to obtain 5×4 . If you know the markup, this can be the fastest way to enter a formula.

Tip

The formula markup resembles the way the formula reads in English.

Below is a short list of common equations and their corresponding markup.

<i>Display</i>	<i>Command</i>	<i>Display</i>	<i>Command</i>
$a = b$	a = b	\sqrt{a}	sqrt {a}
a^2	a^2	a_n	a_n
$\int f(x) dx$	int f(x) dx	$\sum a_n$	sum a_n
$a \leq b$	a <= b	∞	infinity
$a \times b$	a times b	$x \cdot y$	x cdot y

Greek characters

Greek characters (α , β , γ , θ , etc) are common in mathematical formulas. *These characters are not available in the Elements window or the right-click menu.* Fortunately, the markup for Greek characters is simple: Type a % sign followed by the name of the character, in English.

- To write a *lowercase* character, type the name of the character in lowercase.
- To write an *uppercase* character, type the name of the character in uppercase.

A complete table of Greek characters is provided on page 25. See the table below for some examples.

Lowercase	Uppercase
%alpha	%ALPHA
%beta	%BETA
%gamma	%GAMMA
%psi	%PSI
%phi	%PHI
%theta	%THETA

Another way to enter Greek characters is by using the Symbols catalog window. Choose **Tools > Catalog**. This window is shown in Figure 7. Under *Symbol set*, select **Greek** and double-click on a Greek letter from the list. The markup name of the character is shown below the list window.

Figure 7: Symbols catalog, used for entering Greek characters and some special symbols

Example 2: $\pi \simeq 3.14159$

For this example we will suppose that:

- We want to enter the above formula (the value of pi rounded to 5 decimal places).
- We know the name of the Greek character (π).
- But we do not know the markup associated with the \simeq symbol.

Step 1: Type % followed by the text **pi**. This displays the Greek character π .

Step 2: Open the Elements window (**View > Elements**).

Step 3: The \simeq symbol is a relation, so we click on the Relations button. If you hover the mouse over this button you see the tooltip *Relations* (Figure 8).

Figure 9 shows the Selection window after clicking the Relations button. The symbol we want is circled.

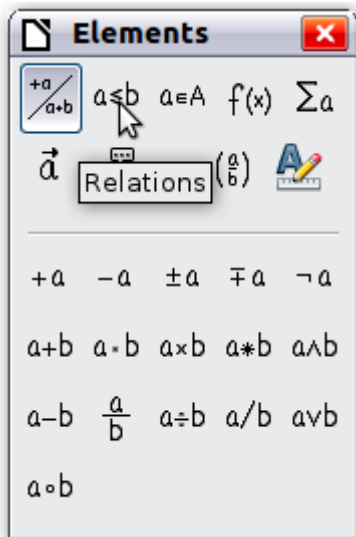


Figure 8: Tooltip indicates the Relations button

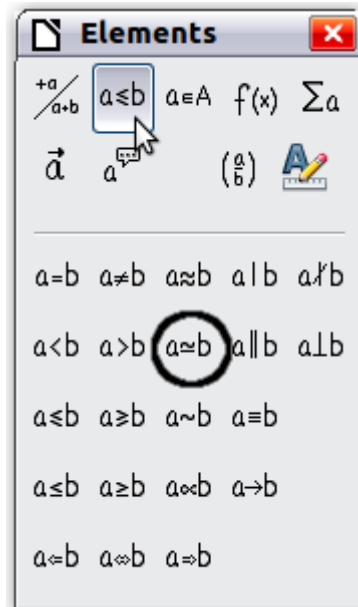


Figure 9: After selecting Relations

Step 4: Click on the $a \simeq b$ symbol. The equation editor now shows the markup **%pi<?> simeq <?>**.

Step 5: Delete the <?> text and add **3.14159** at the end of the equation. We end up with the markup **%pi simeq 3.14159**. The result is shown in Figure 10.

Figure 10. Final result

Customizations

Formula editor as a floating window

The formula editor can cover a large part of the Writer window. To turn the formula editor into a floating window, do this:

- 1) Hover the mouse over the editor frame, as shown in Figure 11.
- 2) Hold down the *Control* key and double-click.

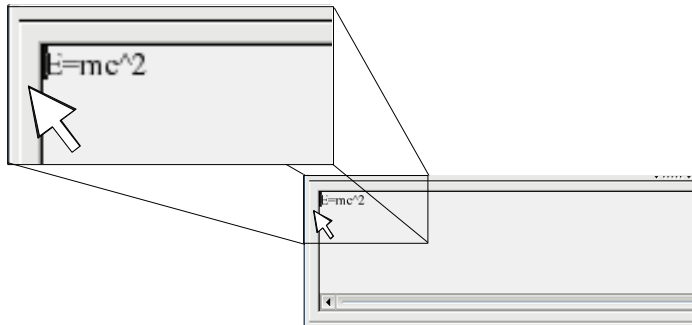


Figure 11: Turning the formula editor into a floating window

Figure 12 shows the result. You can dock the floating window again by using the same steps. Hold down the *Control* key and double-click the window frame.

Figure 12: Formula editor as a floating window

How can I make a formula bigger?

This is one of the most common questions people ask about LibreOffice Math. The answer is simple, but not intuitive:

- 1) Start the formula editor and choose **Format > Font size**.

Figure 13: Changing the font size for a formula

- 2) Select a larger font size under *Base size* (top-most entry)

Figure 14. Edit *Base size* (top) to make a formula bigger

The result of this change is illustrated in Figure 15.

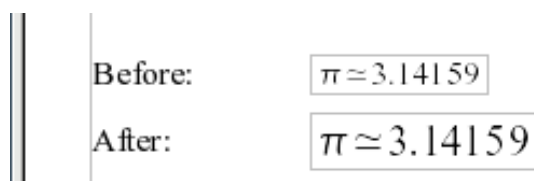


Figure 15. Result of changing the base font size

Formula layout

The most difficult part of using LibreOffice Math comes when writing complicated formulas. This section provides some advice.

Brackets are your friends

LibreOffice Math knows nothing about order of operation. You must use brackets to state the order of operations explicitly. Consider the following example.

Markup	Result
2 over x + 1	
2 over {x + 1}	

Equations over more than one line

Suppose you want to type an equation covering more than one line. For example:

$$\begin{array}{l} x=3 \\ y=1 \end{array}$$

Your first reaction would be to simply press the *Enter* key. However, if you press the *Enter* key, though the markup goes to a new line, the resulting equation does not. You must type the newline command explicitly. This is illustrated in the table below.

Markup	Result
x = 3 y = 1	$x=3 y=1$
x = 3 newline y = 1	

How do I add limits to my sum/integral?

The sum and int commands can (optionally) take the parameters *from* and *to*. These are used for lower and upper limits respectively. These parameters can be used singly or together. Limits for integrals are usually treated as subscripts and superscripts.

Markup	Result
sum from k = 1 to n a_k	
int from 0 to x f(t) dt or int_0^x f(t) dt	or $\int_0^x f(t) dt$
int from Re f	
sum to infinity 2^{-n}	

Note

For more details on integrals and sums, see page 20.

Brackets with matrices look ugly!

For background, we start with an overview of the matrix command.

Markup	Result
matrix { a # b ## c # d }	$\begin{matrix} a & b \\ c & d \end{matrix}$

Note

Rows are separated by two #'s and entries within each row are separated by one #.

The first problem people have with matrices is that brackets do not scale with the matrix:

Markup	Result
<code>(matrix { a # b ## c # d })</code>	$\begin{pmatrix} a & b \\ c & d \end{pmatrix}$

LibreOffice Math provides scalable brackets. That is, the brackets grow in size to match the size of their contents. Use the commands *left()* and *right()* to make scalable brackets.

Markup	Result
<code>left(matrix { a # b ## c # d } right)</code>	

Tip

Use *left[* and *right]* to obtain square brackets.

How do I make a derivative?

Making derivatives essentially comes down to one trick: *Tell LibreOffice it's a fraction.*

In other words, you have to use the *over* command. Combine this with either the letter *d* (for a total derivative) or the *partial* command (for a partial derivative) to achieve the effect of a derivative.

Note

Notice that we have to use braces (squiggly brackets) to make the derivative.

Markup	Result
<code>{df} over {dx}</code>	$\frac{df}{dx}$
<code>{partial f} over {partial y}</code>	$\frac{\partial f}{\partial y}$
<code>{partial^2 f} over {partial t^2}</code>	$\frac{\partial^2 f}{\partial t^2}$

How do I align my equations at the equals sign?

LibreOffice Math does not have a command for aligning equations on a particular character, but you can use a matrix to do this, as shown below.

Markup	Result
<code>matrix{ alignr x+y # {}={ } # alignl 2 ## alignr x # {}={ } # alignl 2-y }</code>	$\begin{array}{rcl} x+y & = & 2 \\ x & = & 2-y \end{array}$

The empty braces around = are necessary because = is a binary operator and thus needs an expression on each side.

You can reduce the spacing around = if you change the inter-column spacing of the matrix:

- 1) With the equation editor open, choose **Format > Spacing** from the menu bar.
- 2) In the Spacing dialog (Figure 16), click the **Category** button and select **Matrices** in the drop-down menu.
- 3) Enter **0%** for Column spacing and click **OK**.

Figure 16: Changing spacing in a matrix formula

Numbering equations

Equation numbering is one of LibreOffice Math's best hidden features. The steps are simple, but obscure:

- 1) Start a new line.
- 2) Type **fn** and then press *F3*.

The *fn* is replaced by a numbered formula:

$$E = mc^2 \tag{2}$$

Now you can double-click on the formula to edit it. For example, here is the Riemann Zeta function:

$$\zeta(z) = \sum_{n=1}^{\infty} \frac{1}{n^z} \tag{3}$$

You can reference an equation ("as shown in Equation (2)") with these steps:

- 1) Choose **Insert > Cross-reference** from the menu bar.
- 2) On the *Cross-references* tab (Figure 17), under *Type*, select *Text*.
- 3) Under *Selection*, select the equation number.
- 4) Under *Format*, select *Reference*.

Click **Insert**.

Done! If you later add more equations to the paper before the referenced equation, all the equations will automatically renumber and the cross-references will update.

Tip

To insert the equation number without parentheses around it, choose *Numbering* instead of *Reference* under *Format*.

Figure 17. Inserting a cross-reference to an equation number

Math commands - Reference

Unary / binary operators

Operation	Command	Display
+sign	+1	+1
−sign	−1	−1
+/- sign	+−1	±1
−/+ sign	−+1	∓1
Boolean not	neg a	$\neg a$
Addition +	a + b	$a+b$
Dot product	a cdot b	$a\cdot b$
Multiplication (X)	a times b	$a\times b$
Multiplication (asterisk)	a * b	$a*b$
Boolean 'and'	a and b	$a\wedge b$
Subtraction (−)	a − b	$a-b$
Division (as a fraction)	a over b	$\frac{a}{b}$
Division (as an operator)	a div b	$a\div b$
Division (with a slash)	a / b	a/b
Boolean 'or'	a or b	$a\vee b$
Concatenation	a circ b	$a\circ b$

Relational operators

Operation	Command	Display
Is equal	$a = b$	$a = b$
Is not equal	$a <> b$	$a \neq b$
Approximately	$a \text{ approx } b$	$a \approx b$
Divides	$a \text{ divides } b$	$a b$
Does not divide	$a \text{ ndivides } b$	$a \nmid b$
Less than	$a < b$	$a < b$
Greater than	$a > b$	$a > b$
Similar to or equal	$a \text{ simeq } b$	$a \simeq b$
Parallel	$a \text{ parallel } b$	$a \parallel b$
Orthogonal to	$a \text{ ortho } b$	$a \perp b$
Less than or equal to	$a \text{ leslant } b$	$a \leq b$
Greater than or equal to	$a \text{ geslant } b$	$a \geq b$
Similar to	$a \text{ sim } b$	$a \sim b$
Congruent	$a \text{ equiv } b$	$a \equiv b$
Less than or equal to	$a \leq b$	$a \leq b$
Greater than or equal to	$a \geq b$	$a \geq b$
Proportional	$a \text{ prop } b$	$a \propto b$
Toward	$a \text{ toward } b$	$a \rightarrow b$
Arrow left	$a \text{ dlarrow } b$	$a \leftarrow b$
Double arrow left and right	$a \text{ dlrarrow } b$	$a \Leftrightarrow b$
Arrow right	$a \text{ drarrow } b$	$a \Rightarrow b$

Set operations

Operation	Command	Display
Is in	a in B	$a \in B$
Is not in	a notin B	$a \notin B$
Owns	A owns b	$A \ni b$
Empty set	emptyset	\emptyset
Intersection	A intersection B	$A \cap B$
Union	A union B	$A \cup B$
Difference	A setminus B	$A \setminus B$
Quotient	A slash B	A / B
Aleph	aleph	\aleph
Subset	A subset B	$A \subset B$
Subset or equal to	A subseteq B	$A \subseteq B$
Superset	A supset B	$A \supset B$
Superset or equal to	A supseteq B	$A \supseteq B$
Not subset	A nsubset B	$A \not\subset B$
Not subset or equal	A nsubseteq B	$A \not\subseteq B$
Not superset	A nsupset B	$A \not\supset B$
Not superset or equal	A nsupseteq B	$A \not\supseteq B$
Set of natural numbers	setN	\mathbb{N}
Set of integers	setZ	\mathbb{Z}
Set of rational numbers	setQ	\mathbb{Q}
Set of real numbers	setR	\mathbb{R}
Set of complex numbers	setC	\mathbb{C}

Functions

Operation	Command	Display
Exponential	func e ^{a}	e^a
Natural logarithm	ln(a)	$\ln(a)$
Exponential function	exp(a)	$\exp(a)$
Logarithm	log(a)	$\log(a)$
Power	a ^{b}	a^b
Sine	sin(a)	$\sin(a)$
Cosine	cos(a)	$\cos(a)$
Tangent	tan(a)	$\tan(a)$
Cotangent	cot(a)	$\cot(a)$
Square root	sqrt{a}	\sqrt{a}
Arcsine	arcsin(a)	$\arcsin(a)$
Arc cosine	arccos(a)	$\arccos(a)$
Arctangent	arctan(a)	$\arctan(a)$
Arc cotangent	arccot(a)	$\operatorname{arccot}(a)$
n th root	nroot{a}{b}	$\sqrt[b]{a}$
Hyperbolic sine	sinh(a)	$\sinh(a)$
Hyperbolic cosine	cosh(a)	$\cosh(a)$
Hyperbolic tangent	tanh(a)	$\tanh(a)$
Hyperbolic cotangent	coth(a)	$\operatorname{coth}(a)$
Absolute value	abs{a}	$ a $
Arc hyperbolic sine	arsinh(a)	$\operatorname{arsinh}(a)$
Arc hyperbolic cosine	arcosh(a)	$\operatorname{arcosh}(a)$
Arc hyperbolic tangent	artanh(a)	$\operatorname{artanh}(a)$
Arc hyperbolic cotangent	arcoth(a)	$\operatorname{arcoth}(a)$
Factorial	fact{a}	$a!$

Operators

All operators can be used with the limit functions (“from” and “to”).

Operation	Command	Display
Limit	<code>lim{a}</code>	$\lim a$
Sum	<code>sum{a}</code>	$\sum a$
Product	<code>prod{a}</code>	$\prod a$
Coproduct	<code>coprod{a}</code>	$\coprod a$
Upper and lower bounds shown with integral	<code>int from {r_0} to {r_t} a</code>	$\int_{r_0}^{r_t} a$
Integral	<code>int{a}</code>	$\int a$
Double integral	<code>iint{a}</code>	$\iint a$
Triple integral	<code>iiint{a}</code>	$\iiint a$
Lower bound shown with summation symbol	<code>sum from{3}b</code>	$\sum_3 b$
Contour integral	<code>lint a</code>	$\oint a$
Double curved integral	<code>llint a</code>	$\oiint a$
Triple curved integral	<code>lllnt a</code>	$\oiiint a$
Upper bound shown with product symbol	<code>prod to{3} r</code>	$\prod^3 r$

Attributes

Operation	Command	Display
Acute accent	acute a	á
Grave accent	grave a	à
Reverse circumflex	check a	ă
Breve	breve a	ă
Circle	circle a	â
Vector arrow	vec a	\vec{a}
Tilde	tilde a	ã
Circumflex	hat a	â
Line above	bar a	\bar{a}
Dot	dot a	â
Wide vector arrow	widevec abc	\vec{abc}
Wide tilde	widetilde abc	\widetilde{abc}
Wide circumflex	widehat abc	\widehat{abc}
Double dot	ddot a	â
Line over	overline abc	\overline{abc}
Line under	underline abc	\underline{abc}
Line through	overstrike abc	\overline{abc}
Triple dot	dddot a	â
Transparent (useful to get a placeholder of a given size)	phantom a	
Bold font	bold a	a
Italic font ¹	ital "a"	<i>a</i>
Resize font	size 16 qv	<i>qv</i>
Following item in sans serif font ²	font sans qv	<i>qv</i>
Following item in serif font	font serif qv	<i>qv</i>
Following item in fixed font	font fixed qv	<i>qv</i>
Make color of following text cyan ³	color cyan qv	<i>qv</i>

1 Unquoted text that is not a command is considered to be a variable. Variables are, by default, italicized.

2 There are three custom fonts: sans serif (without kicks), serifs (with kicks), and fixed (non-proportional). To change the actual fonts used for custom fonts and the fonts used for variables (unquoted text), numbers and functions, use **Format > Fonts**.

3 For all coloring, the color will apply only to the text immediately following the command until the next space is encountered. In order to have the color apply to more characters, place the text you want in color

Operation	Command	Display
Make color of following text yellow	color yellow qv	qv
Make color of following text white	color white qv	qv
Make color of following text green	color green qv	qv
Make color of following text blue	color blue qv	qv
Make color of following text red	color red qv	qv
Make color green returns to default color black	color green X qv	Xqv
Brace items to change color of more than one item	color green {X qv}	Xqv

Miscellaneous

Operation	Command	Display
Infinity	infinity	∞
Partial	partial	∂
Nabla	nabla	∇
There exists	exists	\exists
For all	forall	\forall
H bar	hbar	\hbar
Lambda bar	lambdabar	$\bar{\lambda}$
Real part	re	\Re
Imaginary part	im	\Im
Weierstrass p	wp	\wp
Left arrow	leftarrow	\leftarrow
Right arrow	rightarrow	\rightarrow
Up arrow	uparrow	\uparrow
Down arrow	downarrow	\downarrow
Dots at bottom	dotslow	\dots
Dots at middle	dotsaxis	\cdots
Dots vertical	dotsvert	\vdots
Dots diagonal upward	dotsup	\ddots
Dots diagonal downward	dottdown	\doteq

in curly brackets.

Brackets

Operation	Command	Display
Round Brackets	(a)	(a)
Square Brackets	[b]	$[b]$
Double Square Brackets	\lbracket c \rbracket	$\llbracket c \rrbracket$
Single line	\lvert a \rvert	$ a $
Double line	\lvert\lvert a \rvert\rvert	$\ a\ $
Braces	\lbrace w \rbrace	$\{w\}$
Angle Brackets	\langle d \rangle	$\langle d \rangle$
Operator Brackets	\langle a \mid b \rangle	$\langle a b \rangle$
Group brackets (used for program control)	{a}	a
Scalable round brackets (add the word “left” before a left bracket and “right” before a right bracket)	left (stack{a # b # z} right)	$\left(\begin{array}{c} a \\ b \\ z \end{array} \right)$
Square brackets scalable (as above)	left [stack{ x # y} right]	$\left[\begin{array}{c} x \\ y \end{array} \right]$
Double square brackets scalable	left \lbracket c right \rbracket	$\llbracket c \rrbracket$
Line scalable	left \lvert a \rvert right \rvert	$ a $
Double line scalable	left \lvert\lvert d \rvert\rvert right \rvert\lvert	$\ d\ $
Brace scalable	left \lbrace e \rbrace right \rbrace	$\{e\}$
Angle bracket scalable	left \langle f \rangle right \rangle	$\langle f \rangle$
Operator brackets scalable	left \langle g \mid h \rangle right \rangle	$\langle g h \rangle$
Over brace scalable	{The brace is above} overbrace a	$\overbrace{\text{The brace is above}}^a$
Under brace scalable	{the brace is below} underbrace {f}	$\underbrace{\text{the brace is below}}_f$

Formats

Operation	Command	Display
Left superscript	<code>a lsup{b}</code>	${}^b a$
Center superscript	<code>a csup{b}</code>	$\overset{b}{a}$
Right superscript	<code>a^{b}</code>	a^b
Left subscript	<code>a lsub{b}</code>	${}_b a$
Center subscript	<code>a csub{b}</code>	$\underset{b}{a}$
Right subscript	<code>a_{b}</code>	a_b
Align character to left (text is aligned center by default)	<code>stack { Hello world # alignl (a) }</code>	$\begin{array}{l} \text{Hello world} \\ (a) \end{array}$
Align character to center	<code>stack{Hello world # alignc(a)}</code>	$\begin{array}{c} \text{Hello world} \\ (a) \end{array}$
Align character to right	<code>stack { Hello world # alignr(a)}</code>	$\begin{array}{r} \text{Hello world} \\ (a) \end{array}$
Vertical stack of 2	<code>binom{a}{b}</code>	$\begin{array}{c} a \\ b \end{array}$
Vertical stack, more than 2	<code>stack{a # b # z}</code>	$\begin{array}{c} a \\ b \\ z \end{array}$
Matrix	<code>matrix{ a # b ## c # d }</code>	$\begin{array}{cc} a & b \\ c & d \end{array}$
Equations aligned at '=' (using 'matrix')	<code>matrix{ a # "=" # alignl{b} ## {} # "=" # alignl{c+1} }</code>	$\begin{array}{l} a = b \\ = c + 1 \end{array}$
Equations aligned at '=' (using 'phantom')	<code>stack{ alignl{a} = b # alignl{phantom{a} = c+1} }</code>	$\begin{array}{l} a = b \\ = c + 1 \end{array}$
New line	<code>asldkfjo newline sadkfj</code>	$\begin{array}{l} asldkfjo \\ sadkfj \end{array}$
No gap	<code>nospace { x + y }</code>	$x + y$
Normal	<code>x+y</code>	$x + y$
Small gap (grave)	<code>stuff `stuff</code>	$stuff \text{ ` } stuff$
Large gap (tilde)	<code>stuff~stuff</code>	$stuff \text{ ~ } stuff$

Caution

In localized versions of Writer, the markup names of Greek and special characters are localized. If this document is not localized to the same language, then the names below *may not work* for input. You may still use the Symbol catalog (Figure 7) to select the desired character by its glyph. This will also display the character's localized markup name.

Once entered, the characters will display properly in any language.

Characters – Greek

%ALPHA	A	%BETA	B	%GAMMA	Γ	%DELTA	Δ	%EPSILON	E
%ZETA	Z	%ETA	H	%THETA	Θ	%IOTA	I	%KAPPA	K
%LAMBDA	Λ	%MU	M	%NU	N	%XI	Ξ	%OMICRON	O
%PI	Π	%RHO	P	%SIGMA	Σ	%TAU	T	%UPSILON	Y
%PHI	Φ	%CHI	X	%PSI	Ψ	%OMEGA	Ω		
%alpha	α	%beta	β	%gamma	γ	%delta	δ	%epsilon	ϵ
%varepsilon	ε	%zeta	ζ	%eta	η	%theta	θ	%vartheta	ϑ
%iota	ι	%kappa	κ	%lambda	λ	%mu	μ	%nu	ν
%xi	ξ	%omicron	o	%pi	π	%varpi	ϖ	%rho	ρ
%varrho	ϱ	%sigma	σ	%varsigma	ς	%tau	τ	%upsilon	υ
%phi	ϕ	%varphi	φ	%chi	χ	%psi	ψ	%omega	ω

Characters – Special

%and \wedge	%angle \sphericalangle	%element \in	%identical \equiv
%infinite ∞	%noelement \notin	%notequal \neq	%or \vee
%perthousand \permil	%strictlygreaterthan \gg	%strictlylessthan \ll	%tendto \rightarrow

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