

LaTeX

- The [latex](#) command has been rewritten for Maple 2021, and it can now translate to LaTeX *everything* that can be displayed on a Maple worksheet or document (not [embedded components](#)). The **File > Export As > LaTeX** related functionality has also been rewritten, now resulting in a LaTeX file that contains *equation labels*, hyperlinked in the input and text when they appear as such in the worksheet being exported, and where the input and output in the LaTeX file are formatted using *automatic line breaking*.
- There are now three main ways of using latex.
 - Entering $latex(expression)$ followed by pressing **Enter** produces the display on the screen of the LaTeX form of expression, that you can copy and paste into a .tex file, to be used with any [LaTeX application](#) (not provided with the Maple system).
 - Any Maple expression being displayed, input or output, or a subexpression of it, can be highlighted with the mouse, then translated to LaTeX and copied in one go through right-click and using the menu **Edit > Copy As > Copy as LaTeX**.
 - Any Maple worksheet, say **filename.mw**, can be translated to LaTeX as a whole using the menu **File > Export As > LaTeX**. The resulting file, **filename.tex**, can be processed with any LaTeX application to produce a PDF file that looks as the worksheet. For tips to improve the LaTeX translation see [LaTeX:-Tips](#).
- You can now use **File > Export As > LaTeX** to produce LaTeX versions of course lessons or entire scientific papers *directly in the Maple worksheet*, that combines *what-you-see-is-what-you-get* editing capabilities, including equation labels and all the sophisticated Maple Typesetting available, with the Maple computational engine to produce mathematical results.

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The latex:-Settings

- Several settings of the translation to LaTeX can now be adjusted according to preference, using the *latex:-Settings* command or its synonym *LaTeX:-Settings*. These settings and the corresponding default values can be seen entering the command with no arguments or using the keyword *query*

> *latex:-Settings*()
[*cacheresults = true, commabetweentensorindices = false, invisibletimes = " ",* (1.1)
leavespaceafterfunctionname = false, linelength = 66, powersoftrigonometricfunctions
= mixed, spaceaftersqrt = true, usecolor = true, usedisplaystyleinput = true, useimaginaryunit
= I, useinputlineprompt = true, userestrictedtypesetting = false, usespecialfunctionrules
= true, usetypesettingcurrentsettings = false]

- The possible values of the right-hand sides and their meaning is as follows

- *cacheresults* : all results by the internal latex subroutines are cached, for performance, so the translations are computed only once. However, if you are changing things in your worksheet that affect the way things are displayed, previously cached results may prevent you to get different LaTeX translations for the same input. To avoid caching results pass *cacheresults = false*. Alternatively, use the latex option *forget*, or the command *latex:— Forget()*.
- *commabetweenindices* : default value is *false*; if set to *true*, a comma between tensor indices is placed also in the LaTeX translation, so that they are displayed the same way they are on a Maple sheet.
- *invisibletimes* : sets the string used to represent the product operator, by default " ". That matches the default of the LaTeX typesetting system where *no spacing* is placed between the operands of a product, so $a*b$ is displayed ab . To have a small space between the operands of a product you can use *invisibletimes = "\,"*.
- *leavespaceafterfunctionname* : default value is *false*; if set to *true* no $\!$ LaTeX negative spacing command will be placed between a function name, say F and the large parenthesis $\left(\right)$ surrounding the function's arguments.
- *linelength* : default value is *66*; it indicates the approximate length at which a line-break $\backslash\!$ should be introduced when using the option *breaklines*.
- *powersoftrigonometricfunctions* : default value is *mixed*; other possible values are *textbooknotation* and *computernotation*. With the value *mixed*, $\sin(x + y)^2$ is translated to LaTeX as $\backslash\sin^2(x + y)$, and upon compilation will look like $\sin^2(x + y)$. With the value *textbook*, in addition, inverse trigonometric functions are translated to LaTeX with the notation that uses the name of the corresponding trigonometric function power -1, so $\arcsin(x + y)$ is translated as $\backslash\sin^{-1}(x + y)$. With the value *computer* the translation is an exact replica of what you see displayed on the Maple sheet.
- *spaceaftersqrt* : default value is *true*; to insert or not a LaTeX small spacing command after a square root when it is an operand of a product.
- *usecolor* : default value is *true*, so that colors in the worksheet are translated as such to LaTeX.
- *usedisplaystyleinput* : default value is *true*, so that when using **File > Export As > LaTeX** all the input lines appears preceded by $\backslash\displaystyle$, i.e.: when compiling the .tex file, these lines are displayed with LaTeX *math display style* (the size of the fonts won't depend on the context).
- *useimaginaryunit* : default value is the one shown by *interface(imaginaryunit)*, that in Maple is the capital letter *I*. This setting can be used to indicate the use of a different symbol when translating to LaTeX.
- *useinputlineprompt* : can be *true* or *false*, to put or not a prompt at the beginning of Maple input lines when using **File > Export As > LaTeX**. When the Maple sheet was created as a *worksheet*, *interface(format) = "worksheet"* and so the default value of *useinputlineprompt* is *true*. Otherwise, when it started as a *document*, *interface(format) = "document"* and the value of *useinputlineprompt* is by default *false*. You can use *useinputlineprompt* to override these default values.
- *userestrictedtypesetting* : default value is *false*; if set to *true*, only a restricted form of typesetting, like the one used in the input lines of the Maple help pages, is used when translating to LaTeX.

- `usespecialfunctionrules` : default value is *true*; if set to *false*, no typesetting for the notation of mathematical is used.
- `usetypesettingcurrentsettings` : default is *false*; if set to *true* the Typesetting rules set in the Maple worksheet are not overridden by latex.

Tips for File > Export As > LaTeX

- The section [latex:-Tips](#) present several recommendations to get an optimal translation when exporting Maple sheets using **File > Export As > LaTeX**. Among the most relevant ones:
 - In the worksheet, before exporting, remove *all* or *selectively some* of Maple's *input*, while keeping *all* of Maple's *output* and corresponding equation labels, by respectively using the menus **View > Show/Hide Contents > Input** or **Edit > Delete Element**. This is particularly useful to produce LaTeX mathematical documents that *entirely* or *partially* hide their computer algebra origin.
 - In the worksheet, select any mathematical expression written using Maple syntax that appears within the *text* (e.g. $\text{Int}(f(x), x)$), or as Maple *input* and use **Format > Convert To > 2-D Math Nonexecutable** (or, alternatively, right-click (**Command**-click, on Mac) and select **Convert To > 2-D Math Nonexecutable**) to produce a textbook mathematical display of that expression, that will then appear as such in the LaTeX exported document.
 - In the resulting **filename.txt** file, adjust the new *automatic line-breaking of math formulas* by placing `\\` wherever you want an *additional* line-break, or enclosing a formula's subexpression between `{ }` to avoid its automatic line-breaking.
 - Set several preferences regarding how to perform the LaTeX translation using the [latex:-Settings](#) command. To see the different settings and their current value enter `latex:-Settings()`.

Examples

Fractions are translated using the `\frac` LaTeX command, not elevating the denominator to the power -1

$$\text{> } ee := \frac{a}{x + \frac{y}{3}}$$

$$ee := \frac{a}{x + \frac{y}{3}} \tag{3.1}$$

```
> latex(ee)
\frac{a}{x + \frac{y}{3}}
```

You can use latex or LaTeX indistinctly; these two commands are synonyms of each other.

```
> LaTeX(ee)
\frac{a}{x + \frac{y}{3}}
```

The LaTeX translation is displayed on the screen; that is useful for *copy & paste*, but the actual return value of `latex(ee)` is NULL. If you need a non-NULL return value use `output = string`

```
> latex(ee, output = string)
"\frac{a}{x + \frac{y}{3}}" \tag{3.2}
```

Color is translated the same way you see it on the screen (blue and black are ignored)

$$\begin{aligned}
 > ee := (Int = int) \left(\frac{1}{x^2 + 1}, x \right) \\
 ee &:= \int \frac{1}{x^2 + 1} dx = \arctan(x) \tag{3.3}
 \end{aligned}$$

```

> latex(ee)
\textcolor{gray}{\int}\frac{1}{x^{2}+1}\textcolor{gray}{d}x =
\arctan \! \left(x \right)

```

Translating color is a setting. You can change any of the [latex:-Settings](#) using latex:-Settings(keyword = value) or using its synonym LaTeX:-Settings. To query about these settings use the keyword *query* or enter the command without arguments

```

> latex:-Settings( )
[cacheresults = true, commabetweentensorindices = false, invisibletimes = " ",
leavespaceafterfunctionname = false, linelength = 66, powersoftrigonometricfunctions
= mixed, spaceaftersqrt = true, usecolor = true, usedisplaystyleinput = true, useimaginaryunit
= I, useinputlineprompt = true, userestrictedtypesetting = false, usespecialfunctionrules
= true, usetypesettingcurrentsettings = false]

```

So, for example, to avoid color being translated, you can enter

```

> latex:-Settings(usecolor = false)
[usecolor = false] \tag{3.5}

```

```

> latex(ee)
\int \frac{1}{x^{2}+1}d x = \arctan \! \left(x \right)

```

More varied examples of the interactive use of latex are presented in the [Examples section of the latex help page](#).

Regarding **File > Export As > LaTeX**, as an illustration of the new exporting capabilities, you can open the worksheet [Physics.Examples](#), use the menu **View > Expand All Sections**, then the menu **File > Export As > LaTeX**, and compile the resulting .tex file with any LaTeX app. The resulting PDF file has 86 pages long of LaTeX translated plots, text, input and output with equation labels and sophisticated mathematical notation, showcasing also the new *automatic line-breaking* of long input and output expressions.