UNIVERSITÀ DI PAVIA

Collegio Alessandro Volta
Via Adolfo Ferrata, 17, Pavia (PV)

LaTeX

Lecture 4 – Technical Text

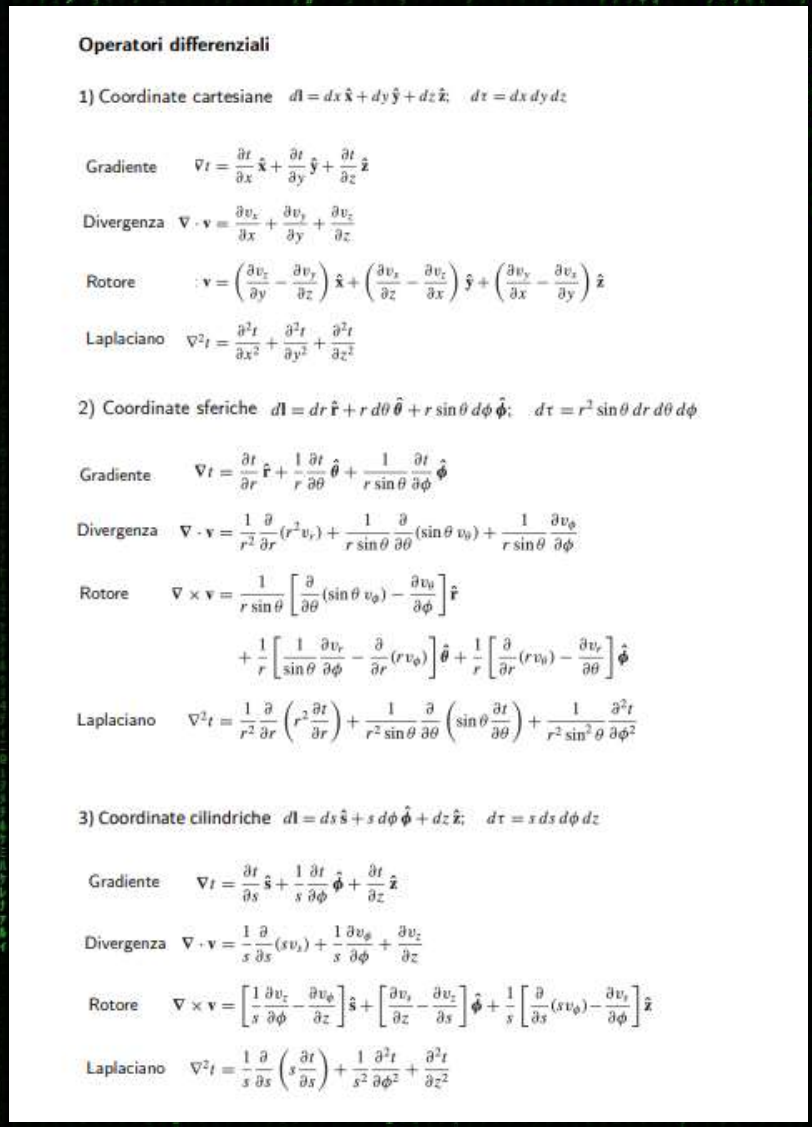
Giovanni Nicola D'Aloisio

Department of Physics – University of Pavia
Classe di Scienze, Tecnologie e Società – IUSS Pavia

E-Mail: giovanninicola.daloisio01@universitadipavia.it

Mathematics

- Typesetting mathematics is one of LaTeX's greatest strengths. It is also a large topic due to the existence of so much mathematical notation.
- If you are writing a scientific document that contains numerous complex formulas, the amsmath and amssymb packages introduce new commands that are more powerful and flexible than the ones provided by basic LaTeX.
- The mathtools package loads the amsmath package and hence there is no need to `\usepackage{amsmath}` in the preamble if mathtools is used, but still import `amsmath` to be more sure.



Operatori differenziali

1) Coordinate cartesiane $d\mathbf{l} = dx\,\hat{\mathbf{x}} + dy\,\hat{\mathbf{y}} + dz\,\hat{\mathbf{z}}$; $d\tau = dx\,dy\,dz$

Gradiente $\nabla t = \frac{\partial t}{\partial x}\hat{\mathbf{x}} + \frac{\partial t}{\partial y}\hat{\mathbf{y}} + \frac{\partial t}{\partial z}\hat{\mathbf{z}}$

Divergenza $\nabla \cdot \mathbf{v} = \frac{\partial v_x}{\partial x} + \frac{\partial v_y}{\partial y} + \frac{\partial v_z}{\partial z}$

Rotore $\nabla \times \mathbf{v} = \left(\frac{\partial v_z}{\partial y} - \frac{\partial v_y}{\partial z}\right)\hat{\mathbf{x}} + \left(\frac{\partial v_x}{\partial z} - \frac{\partial v_z}{\partial x}\right)\hat{\mathbf{y}} + \left(\frac{\partial v_y}{\partial x} - \frac{\partial v_x}{\partial y}\right)\hat{\mathbf{z}}$

Laplaciano $\nabla^2 t = \frac{\partial^2 t}{\partial x^2} + \frac{\partial^2 t}{\partial y^2} + \frac{\partial^2 t}{\partial z^2}$

2) Coordinate sferiche $d\mathbf{l} = dr\,\hat{\mathbf{r}} + r\,d\theta\,\hat{\boldsymbol{\theta}} + r\sin\theta\,d\phi\,\hat{\boldsymbol{\phi}}$; $d\tau = r^2\sin\theta\,dr\,d\theta\,d\phi$

Gradiente $\nabla t = \frac{\partial t}{\partial r}\hat{\mathbf{r}} + \frac{1}{r}\frac{\partial t}{\partial \theta}\hat{\boldsymbol{\theta}} + \frac{1}{r\sin\theta}\frac{\partial t}{\partial \phi}\hat{\boldsymbol{\phi}}$

Divergenza $\nabla \cdot \mathbf{v} = \frac{1}{r^2}\frac{\partial}{\partial r}(r^2 v_r) + \frac{1}{r\sin\theta}\frac{\partial}{\partial \theta}(\sin\theta\, v_\theta) + \frac{1}{r\sin\theta}\frac{\partial v_\phi}{\partial \phi}$

Rotore $\nabla \times \mathbf{v} = \frac{1}{r\sin\theta}\left[\frac{\partial}{\partial \theta}(\sin\theta\, v_\phi) - \frac{\partial v_\theta}{\partial \phi}\right]\hat{\mathbf{r}} + \frac{1}{r}\left[\frac{1}{\sin\theta}\frac{\partial v_r}{\partial \phi} - \frac{\partial}{\partial r}(r v_\phi)\right]\hat{\boldsymbol{\theta}} + \frac{1}{r}\left[\frac{\partial}{\partial r}(r v_\theta) - \frac{\partial v_r}{\partial \theta}\right]\hat{\boldsymbol{\phi}}$

Laplaciano $\nabla^2 t = \frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2\frac{\partial t}{\partial r}\right) + \frac{1}{r^2\sin\theta}\frac{\partial}{\partial \theta}\left(\sin\theta\frac{\partial t}{\partial \theta}\right) + \frac{1}{r^2\sin^2\theta}\frac{\partial^2 t}{\partial \phi^2}$

3) Coordinate cilindriche $d\mathbf{l} = ds\,\hat{\mathbf{s}} + s\,d\phi\,\hat{\boldsymbol{\phi}} + dz\,\hat{\mathbf{z}}$; $d\tau = s\,ds\,d\phi\,dz$

Gradiente $\nabla t = \frac{\partial t}{\partial s}\hat{\mathbf{s}} + \frac{1}{s}\frac{\partial t}{\partial \phi}\hat{\boldsymbol{\phi}} + \frac{\partial t}{\partial z}\hat{\mathbf{z}}$

Divergenza $\nabla \cdot \mathbf{v} = \frac{1}{s}\frac{\partial}{\partial s}(s v_s) + \frac{1}{s}\frac{\partial v_\phi}{\partial \phi} + \frac{\partial v_z}{\partial z}$

Rotore $\nabla \times \mathbf{v} = \left[\frac{1}{s}\frac{\partial v_z}{\partial \phi} - \frac{\partial v_\phi}{\partial z}\right]\hat{\mathbf{s}} + \left[\frac{\partial v_s}{\partial z} - \frac{\partial v_z}{\partial s}\right]\hat{\boldsymbol{\phi}} + \frac{1}{s}\left[\frac{\partial}{\partial s}(s v_\phi) - \frac{\partial v_s}{\partial \phi}\right]\hat{\mathbf{z}}$

Laplaciano $\nabla^2 t = \frac{1}{s}\frac{\partial}{\partial s}\left(s\frac{\partial t}{\partial s}\right) + \frac{1}{s^2}\frac{\partial^2 t}{\partial \phi^2} + \frac{\partial^2 t}{\partial z^2}$

Mathematics environments

- LaTeX needs to know when the text is mathematical, because it typesets math notation differently from normal text.
- As math requires special environments, there are naturally the appropriate environment names you can use in the standard way. Unlike most other environments, however, there are some shorthands for declaring your formulas.
- Using `$$...$$` should be avoided, as it may cause problems. particularly with macros.
- For operators such as `\lim` or `\sum` it might be convenient to write the `\displaystyle` class inside the environment.

Type	Inline	Displayed	Displayed and numbered
Environment	`math`	`displaymath`	`equation`
LaTeX shorthand	`\(...\)`	`\[...\]`	
TeX shorthand	`$...$`	`$$...$$`	
Comment			`equation*` suppresses numbering

In line: $\lim_{i\in\mathbb{N}} \mathbb{Z}/p^i\mathbb{Z}$.

In line, but with `\displaystyle`: $\lim\limits_{i\in\mathbb{N}} \frac{\mathbb{Z}}{p^i\mathbb{Z}}$.

In display:

$$\lim_{i\in\mathbb{N}} \frac{\mathbb{Z}}{p^i\mathbb{Z}}$$

In display, but with `\textstyle`:

$$\lim_{i\in\mathbb{N}} \mathbb{Z}/p^i\mathbb{Z}$$

An example with `cases` (starred version requires the `mathtools` package):

$$G = \begin{cases} \lim\limits_{i\in\mathbb{N}} \frac{\mathbb{Z}}{p^i\mathbb{Z}} & \text{first case} \\ \lim\limits_{i\in\mathbb{N}} \frac{\mathbb{Z}}{q^i\mathbb{Z}} & \text{second case} \end{cases}$$

Note how the fraction is typeset: this too shows that `\textstyle` is in force.

Symbols

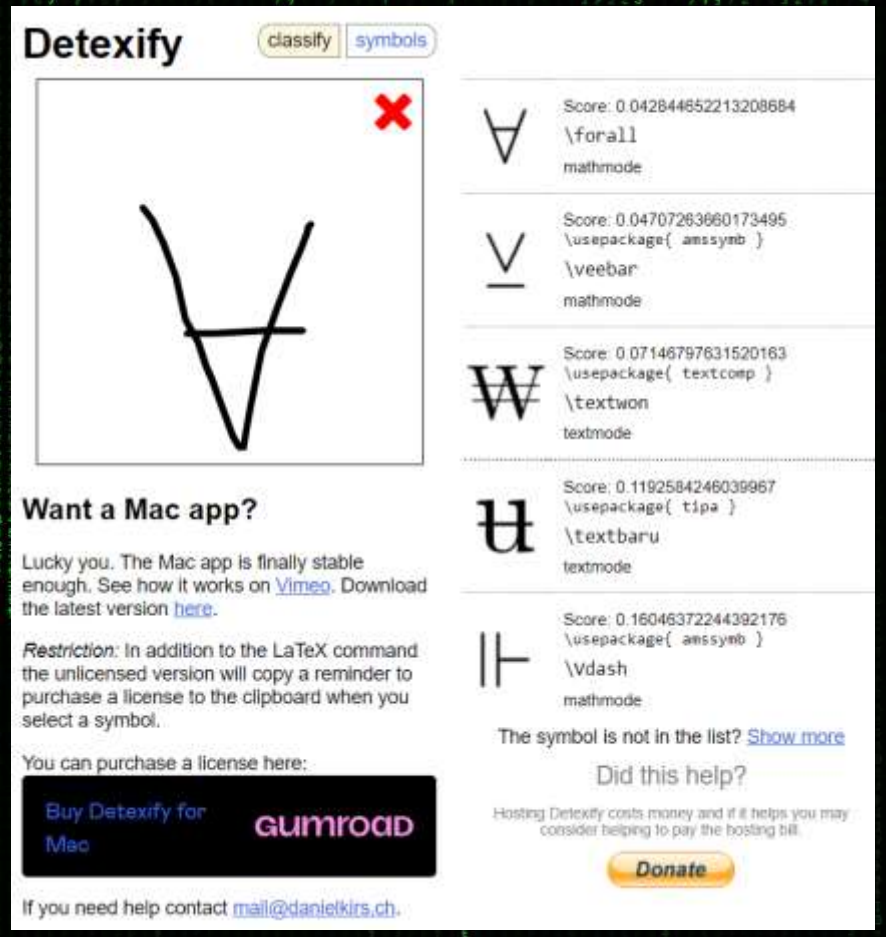
- Although mathematics has many symbols, the set of symbols that can be accessed directly from the keyboard is very short:

  + - = ! / ( ) [ ] < > | ' : *

- Beyond those listed above, distinct commands must be issued in order to display the desired symbols.

```
\forall x \in X, \quad \exists y \leq \epsilon
```

- Fortunately, there's a tool that can greatly simplify the search for the command for a specific symbol. This tool is Detexify.



$$\forall x \in X, \quad \exists y \leq \epsilon$$

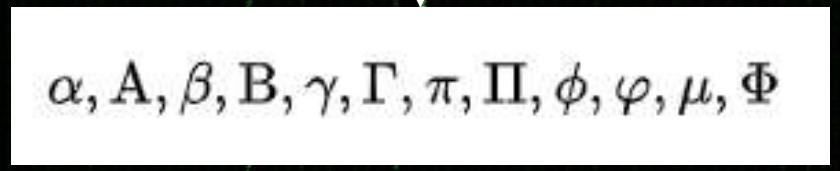
Greek letters

- Greek letters are commonly used in mathematics, and they are very easy to type in math mode. You just have to type the name of the letter after a backslash: if the first letter is lowercase, you will get a lowercase Greek letter, if the first letter is uppercase (and only the first letter), then you will get an uppercase letter.

- Note that Greek letters that look like Latin ones are not provided by LaTeX.

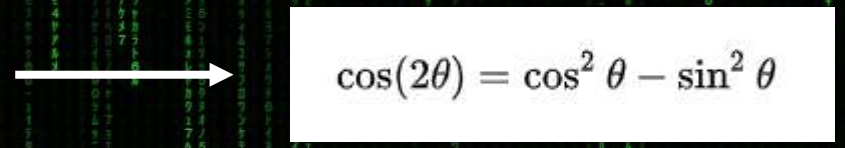
- Lowercase epsilon, theta, kappa, phi, pi, rho, and sigma are provided in two different versions. The variant version is created by adding "var" before the name of the letter.

```
\alpha, \Alpha, \beta, \Beta,
\gamma, \Gamma, \pi, \Pi,
\phi, \varphi, \mu, \Phi
```



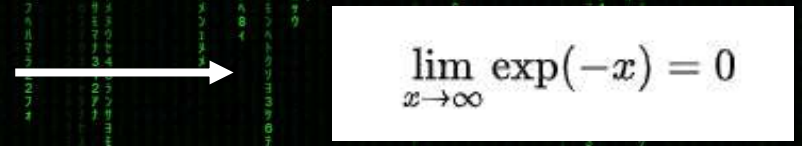
Operators

```
\cos (2\theta) = \cos^2 \theta - \sin^2 \theta
```



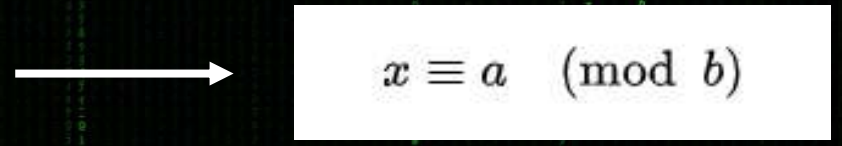
$$\cos(2\theta) = \cos^2\theta - \sin^2\theta$$

```
\lim\limits_{x \to \infty} \exp(-x) = 0
```



$$\lim_{x \to \infty} \exp(-x) = 0$$

```
x \equiv a \pmod{b}
```



$$x \equiv a \pmod{b}$$

```
a \bmod b
```

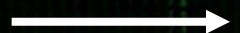
$$a \bmod b$$

Powers and indices

```
k_{n+1} = n^2 + k_n^2 - k_{n-1}
```

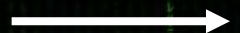
$$k_{n+1} = n^2 + k_n^2 - k_{n-1}$$

```
f(n) = n^5 + 4n^2 + 2 |_{n=17}
```



$$f(n) = n^5 + 4n^2 + 2|_{n=17}$$

```
n^{22}
```



$$n^{22}$$

Fractions and Binomials

```
\frac{n!}{k!(n-k)!} = \binom{n}{k}
```

$$\frac{n!}{k!(n-k)!} = \binom{n}{k}$$

```
\frac{\frac{1}{x}+\frac{1}{y}}{y-z}
```

$$\frac{\frac{1}{x}+\frac{1}{y}}{y-z}$$

```
^3/_7
```

$^{3}/_{7}$

Continued fractions

```
\begin{equation}
  x = a_0 + \cfrac{1}{a_1
          + \cfrac{1}{a_2
          + \cfrac{1}{a_3 + \cfrac{1}{a_4} } } }
\end{equation}
```

$$x = a_0 + \cfrac{1}{a_1 + \cfrac{1}{a_2 + \cfrac{1}{a_3 + \cfrac{1}{a_4}}}}$$

Multiplication of two numbers

```
\begin{equation}
\frac{
    \begin{array}[b]{r}
      \left( x_1 x_2 \right)\\
      \times \left( x'_1 x'_2 \right)
    \end{array}
  }{
    \left( y_1y_2y_3y_4 \right)
  }
\end{equation}
```

$$\frac{\begin{array}[b]{r}\left(x_1 x_2 \right)\\ \times \left(x'_1 x'_2 \right)\end{array}}{\left(y_1y_2y_3y_4 \right)}$$

Sums and integrals

```
\int_0^\infty \mathrm{e}^{-x}\,\mathrm{d}x
```


$$\int_0^\infty \mathrm{e}^{-x}\,\mathrm{d}x$$

```
\displaystyle\sum_{i=1}^{10} t_i
```


$$\displaystyle\sum_{i=1}^{10} t_i$$

```
\sum_{i=1}^{10} t_i
```


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

Some other «big» operators

`\sum`	$\sum$	`\prod`	$\prod$	`\coprod`	$\coprod$
`\bigoplus`	$\bigoplus$	`\bigotimes`	$\bigotimes$	`\bigodot`	$\bigodot$
`\bigcup`	$\bigcup$	`\bigcap`	$\bigcap$	`\biguplus`	$\biguplus$
`\bigsqcup`	$\bigsqcup$	`\bigvee`	$\bigvee$	`\bigwedge`	$\bigwedge$
`\int`	$\int$	`\oint`	$\oint$	`\iint`	$\iint$
`\iiint`	$\iiint$	`\iiiint`	$\iiiint$	`\idotsint`	$\idotsint$

Brackets, braces and delimiters

```
( a ), [ b ], \{ c \}, | d |, \| e \|,
\langle f \rangle, \lfloor g \rfloor,
\lceil h \rceil, \ulcorner i \urcorner,
/ j \backslash
```

$$(a), [b], \{c\}, |d|, \|e\|, \langle f\rangle, \lfloor g\rfloor, \lceil h\rceil, \ulcorner i\urcorner, /j\backslash$$

```
( \big( \Big( \bigg( \Bigg(
```

$$(\big(\Big(\bigg(\Bigg($$

```
\left.\frac{x^3}{3}\right|_0^1
```

$$\left.\frac{x^3}{3}\right|_0^1$$

```
P\left(A=2\middle|\frac{A^2}{B}>4\right)
```

$$P\left(A=2\middle|\frac{A^2}{B}>4\right)$$

Brackets, braces and delimiters

```
\[
 \begin{matrix}
  a & b & c \\
  d & e & f \\
  g & h & i
 \end{matrix}
\]
```

$$\begin{matrix} a & b & c \\ d & e & f \\ g & h & i \end{matrix}$$

```
\begin{matrix}
  -1 & 3 \\
  2 & -4
 \end{matrix}
 =
 \begin{matrix*}[r]
  -1 & 3 \\
  2 & -4
 \end{matrix*}
```

$$\begin{matrix} -1 & 3 \\ 2 & -4 \end{matrix} = \begin{matrix*}[r] -1 & 3 \\ 2 & -4 \end{matrix*}$$

```
A_{m,n} =
 \begin{pmatrix}
  a_{1,1} & a_{1,2} & \cdots & a_{1,n} \\
  a_{2,1} & a_{2,2} & \cdots & a_{2,n} \\
  \vdots  & \vdots  & \ddots & \vdots  \\
  a_{m,1} & a_{m,2} & \cdots & a_{m,n}
 \end{pmatrix}
```

$$A_{m,n} = \begin{pmatrix} a_{1,1} & a_{1,2} & \cdots & a_{1,n} \\ a_{2,1} & a_{2,2} & \cdots & a_{2,n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m,1} & a_{m,2} & \cdots & a_{m,n} \end{pmatrix}$$

Adding text to equations

```
50 \text{ apples} \times 100 \text{ apples}
 = \text{lots of apples}^2
```

$$50 \text{ apples} \times 100 \text{ apples} = \text{lots of apples}^2$$

```
50 \textrm{ apples} \times 100
 \textbf{ apples} = \textit{lots of apples}^2
```

$$50 \text{ apples} \times 100 \textbf{ apples} = \textit{lots of apples}^2$$

Formatting mathematics symbols

Accents

LaTeX command	Sample	Description	Text-mode equivalence
\hat{o}	{\displaystyle {\hat {o}}}	circumflex	\^
\widehat{oo}	{\displaystyle {\widehat {oo}}}	wide version of \hat over several letters	
\check{o}	{\displaystyle {\check {o}}}	vee or check	\v
\tilde{o}	{\displaystyle {\tilde {o}}}	tilde	\~
\widetilde{oo}	{\displaystyle {\widetilde {oo}}}	wide version of \tilde over several letters	
\acute{o}	{\displaystyle {\acute {o}}}	acute accent	\'
\grave{o}	{\displaystyle {\grave {o}}}	grave accent	\`
\dot{o}	{\displaystyle {\dot {o}}}	dot over the letter	\.
\ddot{o}	{\displaystyle {\ddot {o}}}	two dots over the letter (umlaut in text-mode)	\"
\breve{o}	{\displaystyle {\breve {o}}}	breve	\u
\bar{o}	{\displaystyle {\bar {o}}}	macron	\=
\vec{o}	{\displaystyle {\vec {o}}}	vector (arrow) over the letter	

Color

```
\usepackage{xcolor}
```

```
k = {\color{red}x} \mathbin{\color{blue}-} 2
```

$$k = x - 2$$

Plus and minus signs

```
\mp
```

$$\mp$$

```
\pm
```

$$\pm$$

Controlling horizontal spacing

```
\[ f(n) =
  \begin{cases}
    n/2       & \quad \text{if } n \text{ is even}\\
    -(n+1)/2  & \quad \text{if } n \text{ is odd}
  \end{cases}
\]
```

$$f(n) = \begin{cases} n/2 & \text{if } n \text{ is even} \\ -(n+1)/2 & \text{if } n \text{ is odd} \end{cases}$$

align and align*

```
\begin{align*}
 f(x) &= (x+a)(x+b) \\
      &= x^2 + (a+b)x + ab
\end{align*}
```

$$f(x) = (x+a)(x+b)$$
$$= x^2 + (a+b)x + ab$$

```
\begin{align}
 f(x) &= x^4 + 7x^3 + 2x^2 \nonumber \\
      &\qquad {} + 10x + 12
\end{align}
```

$$f(x) = x^4 + 7x^3 + 2x^2$$
$$+ 10x + 12 \qquad (3)$$

Insights

- WikiBooks – LaTeX/Mathematics
- WikiBooks – LaTeX/Advanced Mathematics
- LaTeX Cheatsheet

```
\[
 z = \overbrace{
   \underbrace{x}_\text{real} + i
   \underbrace{y}_\text{imaginary}
  }^\text{complex number}
\]
```

$$z = \overbrace{\underbrace{x}_{\text{real}} + i \underbrace{y}_{\text{imaginary}}}^{\text{complex number}}$$

```
\begin{gather*}
a_0=\frac{1}{\pi}\int\limits_{-\pi}^{\pi}f(x)\,\mathrm{d}x\\[6pt]
\begin{split}
a_n=\frac{1}{\pi}\int\limits_{-\pi}^{\pi}f(x)\cos nx\,\mathrm{d}x=\\
=\frac{1}{\pi}\int\limits_{-\pi}^{\pi}x^2\cos nx\,\mathrm{d}x
\end{split}\\[6pt]
\begin{split}
b_n=\frac{1}{\pi}\int\limits_{-\pi}^{\pi}f(x)\sin nx\,\mathrm{d}x=\\
=\frac{1}{\pi}\int\limits_{-\pi}^{\pi}x^2\sin nx\,\mathrm{d}x
\end{split}\\[6pt]
\end{gather*}
```

$$a_0 = \frac{1}{\pi}\int_{-\pi}^{\pi} f(x)\,\mathrm{d}x$$

$$\begin{aligned} a_n &= \frac{1}{\pi}\int_{-\pi}^{\pi} f(x)\cos nx\,\mathrm{d}x = \\ &= \frac{1}{\pi}\int_{-\pi}^{\pi} x^2\cos nx\,\mathrm{d}x \end{aligned}$$

$$\begin{aligned} b_n &= \frac{1}{\pi}\int_{-\pi}^{\pi} f(x)\sin nx\,\mathrm{d}x = \\ &= \frac{1}{\pi}\int_{-\pi}^{\pi} x^2\sin nx\,\mathrm{d}x \end{aligned}$$

Theorems

- With "theorem" we can mean any kind of labelled enunciation that we want to look separated from the rest of the text and with sequential numbers next to it.
- This approach is commonly used for theorems in mathematics, but can be used for anything. LaTeX provides a command that will let you easily define any theorem-like enunciation.

```
\usepackage{amsthm}
```

```
\newtheorem{mydef}{Definition}
```

```
\begin{mydef}
Here is a new definition
\end{mydef}
```

Definition 1 *Here is a new definition*

```
\newtheorem*{mydef}{Definition}
```

Not numbered

```
\newtheorem{name}{Printed output}[numberby]
```

Numbered

Theorems

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Definition 1 *Here is a new definition*

```
\newtheorem*{mydef}{Definition}
```

Not numbered

```
\newtheorem{name}{Printed output}[numberby]
```

Numbered

Theorems & Proofs

- The proof environment can be used for adding the proof of a theorem. Basicly:

```
\begin{proof}
    Here is my proof
\end{proof}
```

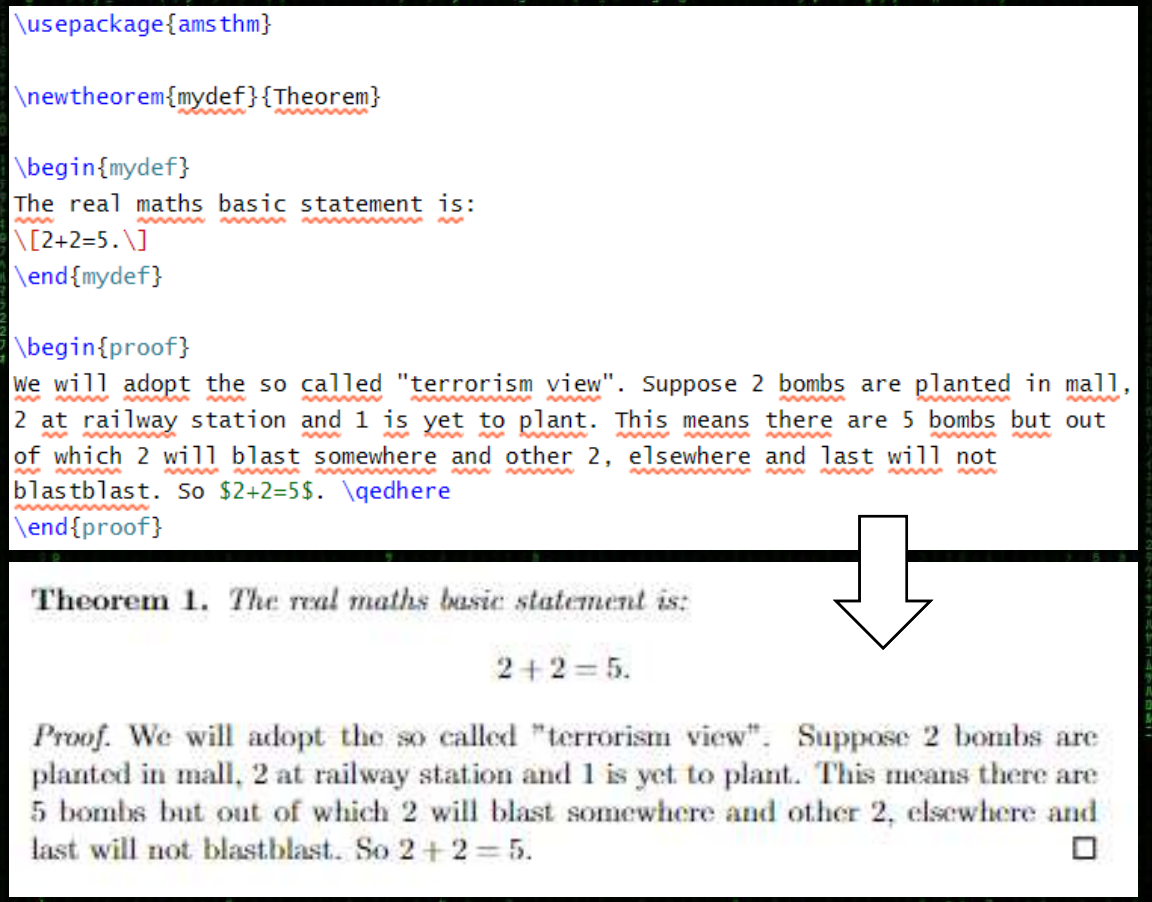
- To manually name the proof:

```
\begin{proof}[Title]
```

- To put the Q.E.D. symbol at the end of the last line, use the \qedhere command, that can be redefined with:

```
\renewcommand{\qedsymbol}{}
```

```
\usepackage{amsthm}

\newtheorem{mydef}{Theorem}

\begin{mydef}
The real maths basic statement is:
\[2+2=5.\]
\end{mydef}

\begin{proof}
We will adopt the so called "terrorism view". Suppose 2 bombs are planted in mall,
2 at railway station and 1 is yet to plant. This means there are 5 bombs but out
of which 2 will blast somewhere and other 2, elsewhere and last will not
blastblast. So $2+2=5$. \qedhere
\end{proof}
```



Theorem 1. *The real maths basic statement is:*

$$2 + 2 = 5.$$

Proof. We will adopt the so called "terrorism view". Suppose 2 bombs are planted in mall, 2 at railway station and 1 is yet to plant. This means there are 5 bombs but out of which 2 will blast somewhere and other 2, elsewhere and last will not blastblast. So $2 + 2 = 5$. □

Theorem styles

- To define a new style for theorems:

```
\newtheoremstyle{stylename}% name of the style to be used
  {spaceabove}% measure of space to leave above the theorem. E.g.: 3pt
  {spacebelow}% measure of space to leave below the theorem. E.g.: 3pt
  {bodyfont}% name of font to use in the body of the theorem
  {indent}% measure of space to indent
  {headfont}% name of head font
  {headpunctuation}% punctuation between head and body
  {headspace}% space after theorem head; " " = normal interword space
  {headspec}% Manually specify head
```

- Here is a list of the possible pre-defined styles:

plain	Used for theorems, lemmas, propositions, etc. (default)	Theorem 1. *Theorem text.*
definition	Used for definitions and examples	Definition 2. Definition text.
remark	Used for remarks and notes	*Remark* 3. Remark text.

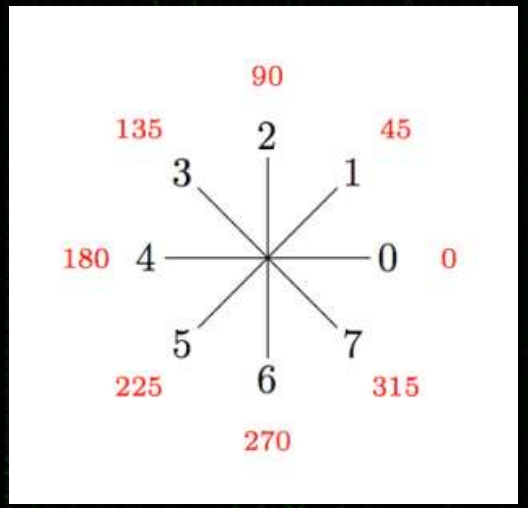
Chemical Graphics

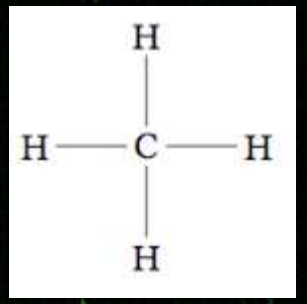
- chemfig is a package used to draw 2D chemical structures. It is an alternative to ochem;
- chemfig uses the tikz package to produce its graphics;
- For using chemfig, add `\usepackage{chemfig}` to the preamble;
- Primary command:

```
\chemfig{<atom1><bond type>[<angle>,<coeff>,<tikz code>]<atom2>}
```

Basic chemistry

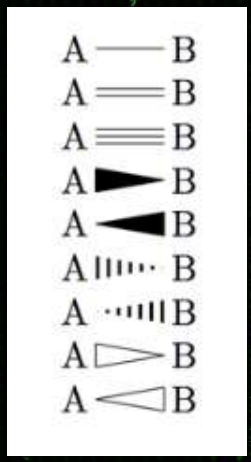
```
\chemfig{(-[:0,1.5,,,draw=none]\scriptstyle\color{red}0)
(-[1]1)(-[:45,1.5,,,draw=none]\scriptstyle\color{red}45)
(-[2]2)(-[:90,1.5,,,draw=none]\scriptstyle\color{red}90)
(-[3]3)(-[:135,1.5,,,draw=none]\scriptstyle\color{red}135)
(-[4]4)(-[:180,1.5,,,draw=none]\scriptstyle\color{red}180)
(-[5]5)(-[:225,1.5,,,draw=none]\scriptstyle\color{red}225)
(-[6]6)(-[:270,1.5,,,draw=none]\scriptstyle\color{red}270)
(-[7]7)(-[:315,1.5,,,draw=none]\scriptstyle\color{red}315)
-0}
```






```
\chemfig{C(-[:0]H)(-[:90]H)(-[:180]H)(-[:270]H)}
```

```
\chemfig{A-B}\\
\chemfig{A=B}\\
\chemfig{A~B}\\
\chemfig{A>B}\\
\chemfig{A<B}\\
\chemfig{A>:B}\\
\chemfig{A<:B}\\
\chemfig{A>|B}\\
\chemfig{A<|B}\\
```



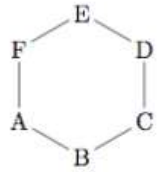
Skeletal & ring diagrams

```
\chemfig{-[:30]=[:-30]-[:30]}
```

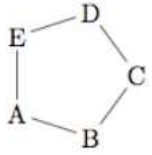
```
\chemfig{-[:30]-[:-30]-[:30]}
```

```
\chemfig{**5(------)}
```

```
\chemfig{A*6(-B-C-D-E-F-)}
```



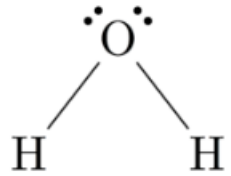

```
\chemfig{A*5(-B-C-D-E-)}
```




```
\chemfig{*6(=-=-=-)}
```

Lewis Structures

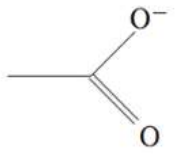
```
\chemfig{H-[:52.24]\charge{45=\:,135=\:}{O}-[::-104.48]H}
```



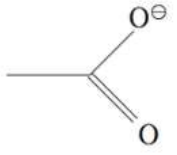

```
\charge{0=\.,90=\.,180=\.,270=\.}{C}
```

Ions

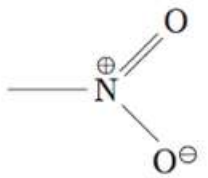
```
\chemfig{-(-[1]O^{-})=[7]O}
```



```
\chemfig{-(-[1]O^{\ominus})=[7]O}
```



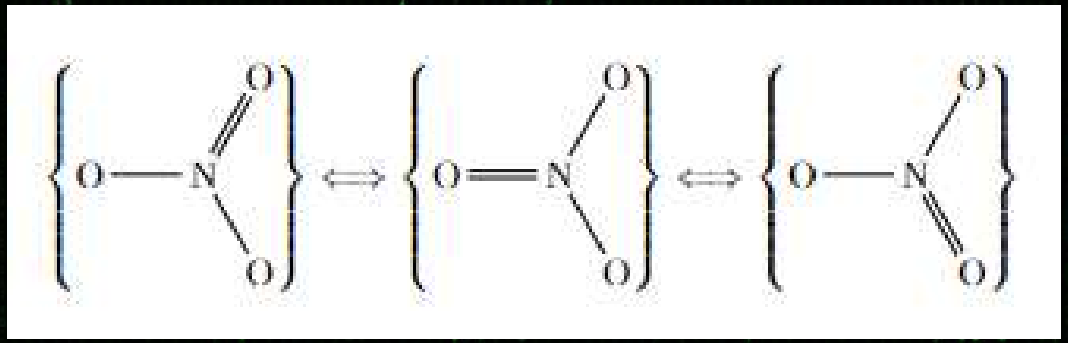
```
\chemfig{-\chemabove{N}{\scriptstyle\oplus}(=[1]O)-[7]O^{\ominus}}
```



Try it by yourself

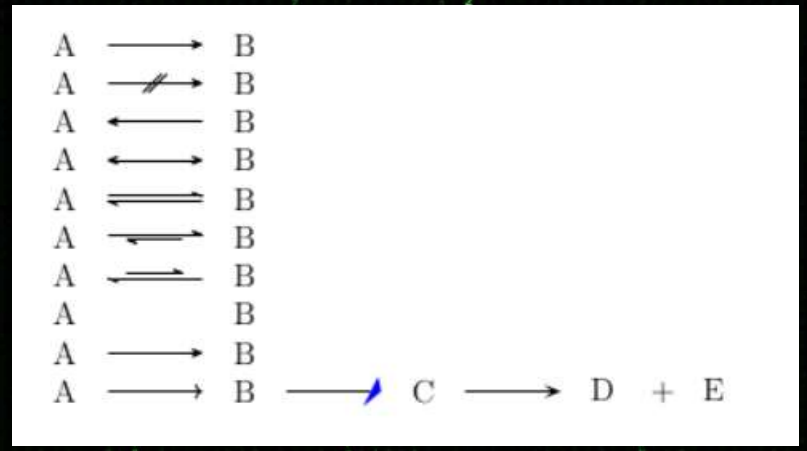
```
% see "Advanced Mathematics" for use of \left
and \right
% add to preamble:
%       \usepackage{mathtools} %
\Longleftrightarrow
$\left\{\chemfig{O-N(=[:60]O)-[:300]O}\right\}
\Longleftrightarrow
\left\{\chemfig{O=N(-[:60]O)-[:300]O}\right\}
\Longleftrightarrow
\left\{\chemfig{O-N(-[:60]O)=[:300]O}\right\}$
```

Formal Charges
Resonance Structures



Chemical Reactions

```
\schemestart A\arrow{->}B\schemestop\par % by default
\schemestart A\arrow{-/>}B \schemestop\par
\schemestart A\arrow{<-}B \schemestop\par
\schemestart A\arrow{<->}B \schemestop\par
\schemestart A\arrow{<=>}B \schemestop\par
\schemestart A\arrow{<->>}B \schemestop\par
\schemestart A\arrow{<<->}B \schemestop\par
\schemestart A\arrow{0}B \schemestop\par
\schemestart A\arrow{-U>}B \schemestop\par
\schemestart
A\arrow[,,->] B\arrow[,,-{Triangle[slant=0.5,blue,width=10pt]}]
C\arrow[,,-{CF[sharp]}] D \+ E
\schemestop
```



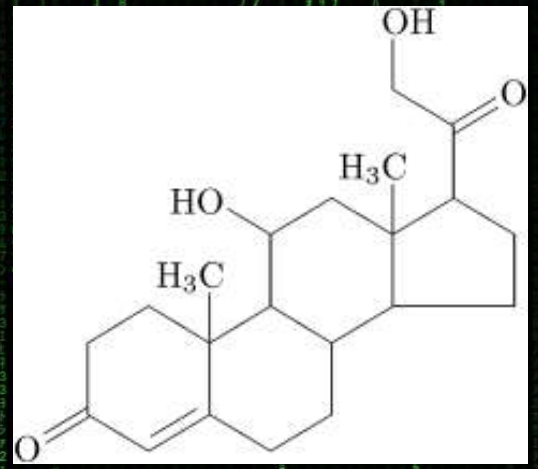
Chemical Formulas & Advanced Chemistry

- mhchem is a package used to typeset chemical formulae and equations. As well as typeset basic 2D chemical structures.

```
\usepackage[version=4]{mhchem}
```

```
\ce{3H2O} \\
\ce{1/2H2O} \\
\ce{AgCl2-} \\
\ce{H2_{(aq)}} \\
```

$$3\,H_2O$$
$$\tfrac{1}{2}H_2O$$
$$AgCl_2^-$$
$$H_{2(aq)}$$

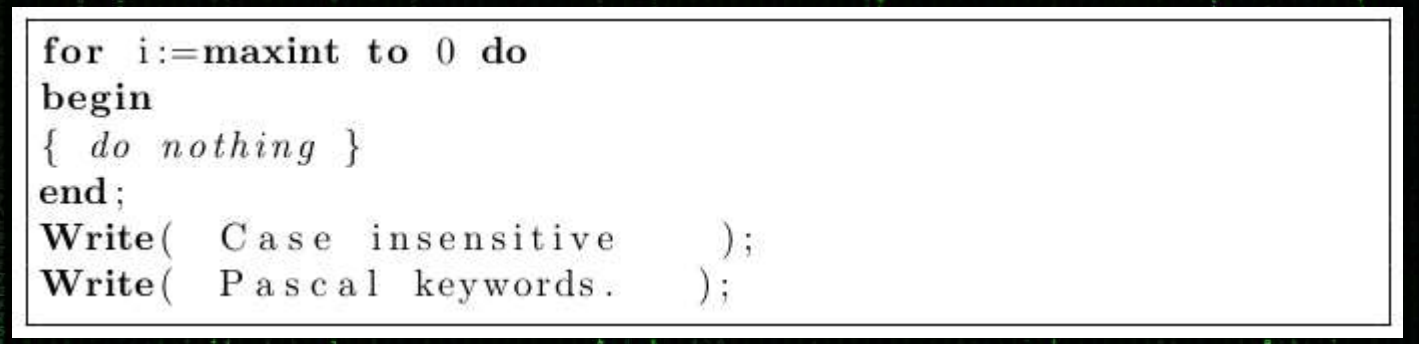



```
\documentclass{letter}
\usepackage{epic,carom}
\pagestyle{empty}
\begin{document}
\begin{picture}(1000,500)
  \put(0,0){\steroid[d]{3D==O;{{10}}==\lmoiety{H$_{3}$C};{{13}}==\lmoiety{H$_{3}$C};{{11}}==HO}}
  \put(684,606){\sixunitv{}{2D==O;1==OH}{cdef}}
\end{picture}
\end{document}
```

Source Codes & Algorithms

- listings – Slightly outdated due to lacking maintenance, but still very useful and functionality rich;
- minted – It uses Python library Pygments for code highlighting, which boasts over 500 supported languages and text formats (but it needs some libraries to be set up).

```
\documentclass{article}
\usepackage{listings}               % Include the listings-package
\begin{document}
\lstset{language=Pascal}            % Set your language (you can ch

\begin{lstlisting}[frame=single]  % Start your code-block
for i:=maxint to 0 do
begin
{ do nothing }
end;
Write('Case insensitive ');
Write('Pascal keywords.');
\end{lstlisting}

\end{document}
```



```
for i:=maxint to 0 do
begin
{ do nothing }
end;
Write( Case insensitive );
Write( Pascal keywords. );
```

Customizing listing environments

```
\lstset{
  backgroundcolor=\color{white},   % choose the background color; you must add \usepackage{color}
  basicstyle=\footnotesize,        % the size of the fonts that are used for the code
  breakatwhitespace=false,         % sets if automatic breaks should only happen at whitespace
  breaklines=true,                 % sets automatic line breaking
  captionpos=b,                    % sets the caption-position to bottom
  commentstyle=\color{mygreen},    % comment style
  deletekeywords={...},            % if you want to delete keywords from the given language
  escapeinside={\%*}{*)},          % if you want to add LaTeX within your code
  extendedchars=true,              % lets you use non-ASCII characters; for 8-bits encodings only, does not work with UTF-8
  firstnumber=1000,                % start line enumeration with line 1000
  frame=single,                    % adds a frame around the code
  keepspaces=true,                 % keeps spaces in text, useful for keeping indentation of code
  keywordstyle=\color{blue},       % keyword style
  language=Octave,                 % the language of the code
  morekeywords={*,...},            % if you want to add more keywords to the set
  numbers=left,                    % where to put the line-numbers; possible values are (none, left, right)
  numbersep=5pt,                   % how far the line-numbers are from the code
  numberstyle=\tiny\color{mygray}, % the style that is used for the line-numbers
  rulecolor=\color{black},         % if not set, the frame-color may be changed on line-breaks within not-black text
  showspaces=false,                % show spaces everywhere adding particular underscores; it overrides 'showstringspaces'
  showstringspaces=false,          % underline spaces within strings only
  showtabs=false,                  % show tabs within strings adding particular underscores
  stepnumber=2,                    % the step between two line-numbers. If it's 1, each line will be numbered
  stringstyle=\color{mymauve},     % string literal style
  tabsize=2,                       % sets default tabsize to 2 spaces
  title=\lstname                   % show the filename of files included with \lstinputlisting
}
```

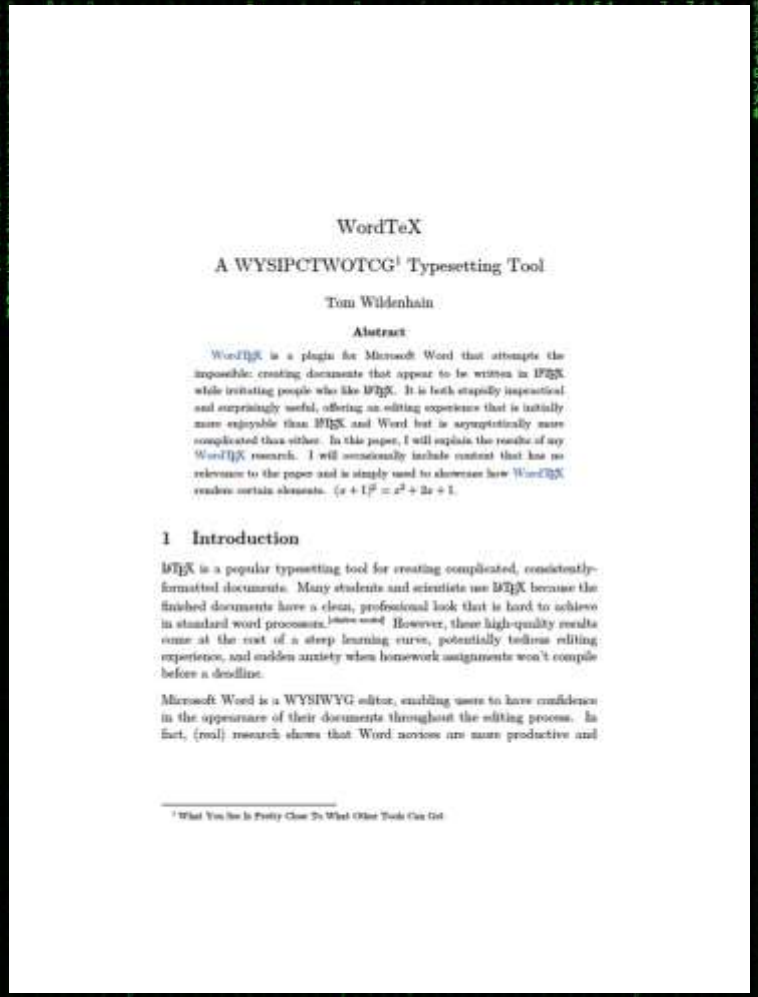
An example with C

```
\lstdefinestyle{customc}{belowcaptionskip=1\baselineskip,  breaklines=true, frame=L, xleftmargin=\parindent, language=C,
showstringspaces=false, basicstyle=\footnotesize\ttfamily, keywordstyle=\bfseries\color{green!40!black},
commentstyle=\itshape\color{purple!40!black}, identifierstyle=\color{blue}, stringstyle=\color{orange},}

\lstset{escapechar=@,style=customc}

\begin{lstlisting}
#include <stdio.h>
#define N 10
/* Block
 * comment */

int main()
{
    int i;

    // Line comment.
    puts("Hello world!");

    for (i = 0; i < N; i++)
    {
        puts("LaTeX is also great for programmers!");
    }

    return 0;
}
\end{lstlisting}

\lstinputlisting[caption=Scheduler, style=customc]{hello.c}
```

```c
#include <stdio.h>
#define N 10
/* Block
 * comment */

int main()
{
    int i;

    // Line comment.
    puts("Hello world!");

    for (i = 0; i < N; i++)
    {
        puts("LaTeX is also great for programmers!");
    }

    return 0;
}
```

WordTeX

- WordTeX is a plugin for Microsoft Word that attempts the impossible: creating documents that appear to be written in LaTeX while irritating people who like LaTeX.
- It is both stupidly impractical and surprisingly useful, offering an editing experience that is initially more enjoyable than LATEX and Word but is asymptotically more complicated than either.
- More information here.



WordTeX

A WYSIPCTWOTCG[1] Typesetting Tool

Tom Wildenhain

Abstract

WordTEX is a plugin for Microsoft Word that attempts the impossible: creating documents that appear to be written in LATEX while irritating people who like LATEX. It is both stupidly impractical and surprisingly useful, offering an editing experience that is initially more enjoyable than LATEX and Word but is asymptotically more complicated than either. In this paper, I will explain the results of my WordTEX research. I will occasionally include content that has no relevance to the paper and is simply used to showcase how WordTEX renders certain elements. $(x+1)^2 = x^2 + 2x + 1$.

1 Introduction

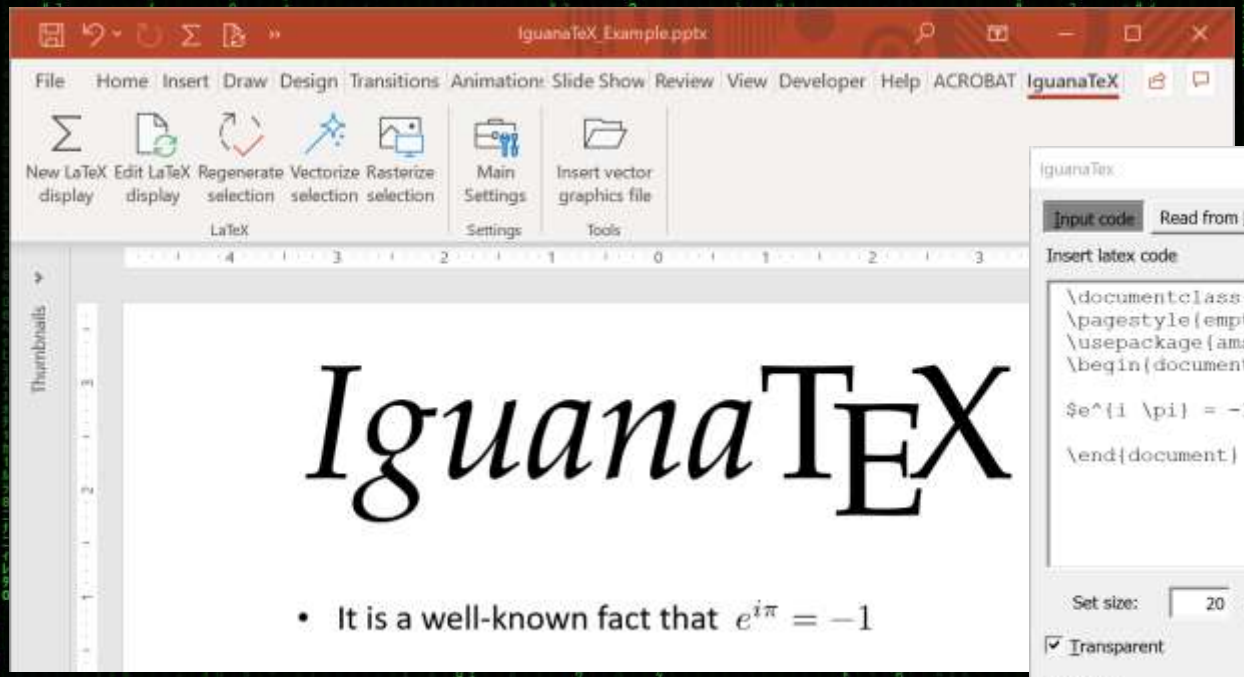
LATEX is a popular typesetting tool for creating complicated, consistently-formatted documents. Many students and scientists use LATEX because the finished documents have a clean, professional look that is hard to achieve in standard word processors.[citation needed] However, these high-quality results come at the cost of a steep learning curve, potentially tedious editing experience, and sudden anxiety when homework assignments won't compile before a deadline.

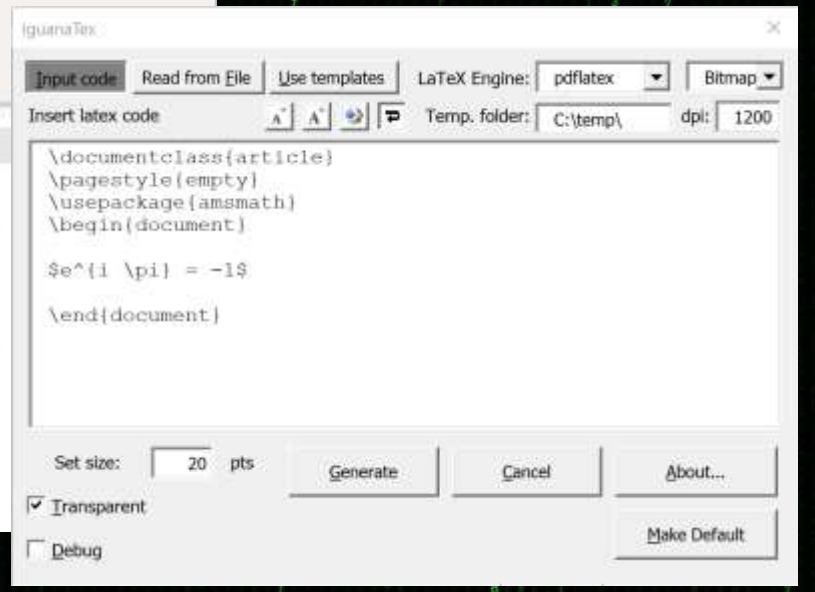
Microsoft Word is a WYSIWYG editor, enabling users to have confidence in the appearance of their documents throughout the editing process. In fact, (real) research shows that Word novices are more productive and

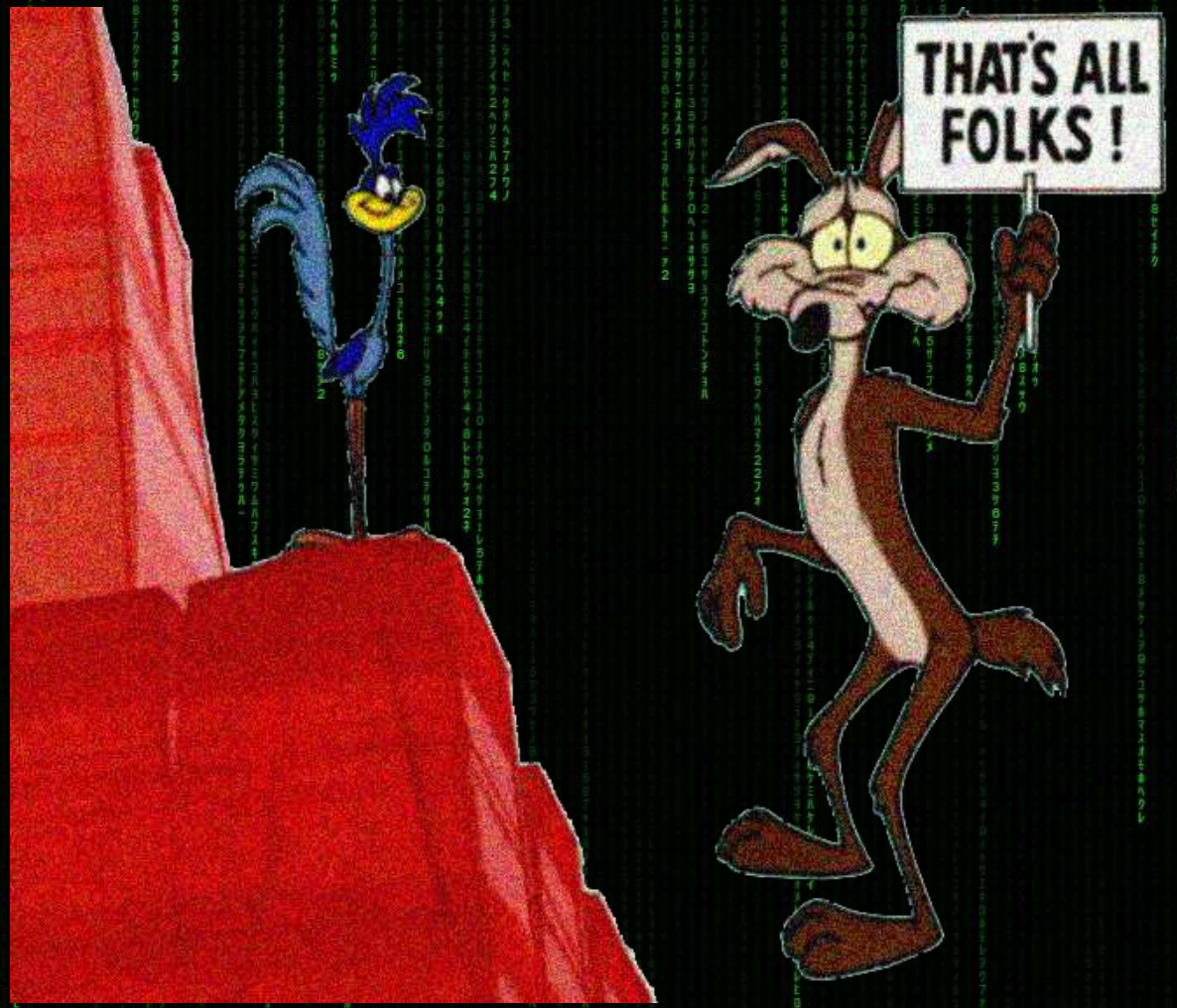
[1] What You See Is Pretty Close To What Other Tools Can Get

IguanaTex

IguanaTex is an open source PowerPoint add-in which allows you to insert LaTeX equations into your fancy presentations.






THAT'S ALL
FOLKS !