\documentclass{article}
\usepackage{amsmath}
\begin{document}
\title{\LaTeX{} NICETIES
MATLABICIAN}
\maketitle

\textbf{SUMMARY.} Some \LaTeX{} niceties, from George Grätzer’s \textit{More Math into \LaTeX{}}, unless cited otherwise. To be able to jump to the corresponding part of the \LaTeX{} file by double clicking on the typeset output in the DVI file, make sure linking to source is active in your DVI viewer; in Yap make sure that the “Inverse DVI Search” option points to your \LaTeX{} editor and, to see the “hot points,” that “Show Source Links” is checked in the “User Interface” option tab.

\begin{itemize}
\item \{\}
Use the symbol $\dagger$—given by $\{\dagger\}$—to indicate the dual space, where \{\} is the empty group. The empty group can be used to separate symbols, to terminate commands, or as the base for subscripting and superscripting.
\begin{align*}
A_{21}A_{11}^{-1}A_{21}^T & \times \\
A_{21}A_{11}^{-1}A_{21}^T & \checkmark
\end{align*}
Notice that in the first formula above the subscripts are not on the same horizontal level. This has been corrected in the second expression by typing $A_\{21\}^{-1}\{\}$, where the empty group has the effect of lowering the subscript to the desired level. [NJH-Handbook of Writing for Mathematical Sciences-p. 192]

\item : and \texttt{\colon}
\begin{align*}
f : x \to x^2 & \times \\
f : x \to x^2 & \checkmark
\end{align*}
\begin{align*}
A(2 : m - 1, 2 : n - 1) & \times \\
A(2 : m - 1, 2 : n - 1) & \checkmark
\end{align*}

\item \texttt{'} and \texttt{\prime}
\begin{align*}
f' & \times \\
f' & \checkmark
\end{align*}

\item The en-dash (–) is also used when the first part of a compound word does not modify the meaning of the second part; it can be thought of as standing for \textit{and} or \textit{to}. Examples: Gauss–Chebyshev quadrature, Moore–Penrose inverse, left–right evaluation. An exception is Runge-Kutta method, for which most authors use a hyphen. [NJH-Handbook of Writing for Mathematical Sciences-p. 188]

\item Fill with \texttt{\dotfill} ......................................................p. 123
\end{itemize}
\end{document}
\phantom{f(x) = \begin{cases} -x, & \text{if } x \leq 0; \\ x^2, & \text{if } x > 0. \end{cases}}

MATLAB \(\text{\textregistered}\)

& SIMULINK

\[ x_1 + y_1 + \left( \sum_{i=1}^{5} \frac{5}{i} + a^2 \right)^2 \]
\[ - \left( \sum_{i=1}^{5} \frac{5}{i} + a^2 \right)^2 \]

Boxed text cannot be broken, so if you want to frame more than one line of text, place it in the argument of a \texttt{parbox} command or within a \texttt{minipage} environment.

\TeX\ starting from \[1\]

A circled “A” in the margin.

End of proof symbol (aka Halmos): ■

\begin{itemize}
    \item Compare: \texttt{ab}, \texttt{\textbar ab\textbar}, and \texttt{\textbar ab\textbar}
    \item \texttt{AM} no space correction for command declarations.
    \texttt{MM} space correction for command declarations.
    \item Be careful when the line after \texttt{\\} starts with []\texttt{a} is OK and produces [a]. \texttt{[b]} would generate an error.
    \item \texttt{\textsf{enumerate}} in \texttt{definition} is not trivial; an \texttt{\textsf{hfill}} is needed.
\end{itemize}

\textbf{Definition 1.}

(1) \(u\) is bold if \(u = x^2\).

(2) \(u\) is thin if \(u = \sqrt{x}\).

\textbf{Automatic QED symbol and \texttt{\textsf{\textbackslash qed\textbackslash here}}}

\textit{Proof.} Now the proof follows from the equation
\[ a^2 = b^2 + c^2. \]
\[ \square \]

\textit{Proof.} Now the proof follows from the equation
\[ a^2 = b^2 + c^2. \] \[ \square \]

\textbullet \ $i = 1$, $\ldots$, $n$ to produce \(i = 1, 2, \ldots, n\) (Highly aesthetic, GG’s preference.)

\textbullet \ Space correction after \texttt{\textsf{\textbackslash sqrt}}

\(\sqrt{-5}\) bad and \(\sqrt{-5}\) good

\[2\text{George Grätzer.}\]
\textbf{\LaTeX\ niceties 3}

- \texttt{\sqrt} and its refinement with \texttt{\uproot}
  \[ \sqrt{5} \times \]
  \[ \sqrt{5} \checkmark \]

- The \texttt{\dfrac} command is often used in matrices whose entries would look too small with the \texttt{\frac} command (\texttt{d} in \texttt{\dfrac} stands for “display”):
  \[ \frac{3+a^2}{4+b} \]
  \[ \frac{3 + a^2}{4 + b} \checkmark \]

- \texttt{\dots} and \texttt{\cdots}
  \[ \alpha(x_1 + x_2 + \ldots) \times \]
  \[ \alpha(x_1 + x_2 + \cdots) \checkmark \]

- \texttt{\int_{-\infty}^{\infty}} and \texttt{\int\limits_{-\infty}^{\infty}}
  \[ \int_{-\infty}^{\infty} e^{-x^2} \, dx = \sqrt{\pi} \]
  \[ \int\limits_{-\infty}^{\infty} e^{-x^2} \, dx = \sqrt{\pi} \]

- \texttt{\textbackslash left}, \texttt{\right}, \texttt{\bigl}, and \texttt{\Bigr}
  The \texttt{\left} and \texttt{\right} commands must be paired in order for \LaTeX\ to know the extent of the material to be vertically measured. However, the delimiters need not be the same:
  \[ F(x)\big|^{b}_{a} \quad F(x)\big|^{b}_{a} \quad F(x)\big|^{b}_{a} \quad F(x)\big|^{b}_{a} \]

- The delimiters produced by \texttt{\left} and \texttt{\right} use too much interline space in \[ \left| \frac{a}{b} \right| \]. Use \texttt{\bigl} and \texttt{\bigr} to produce delimiters that lie within the normal line spacing: \[ \left| \frac{a}{b} \right| \]
  \[ \left[ \sum_{i} a_i \right]^{1/p} \times \]
  \[ \left[ \sum_{i} a_i \right]^{1/p} \checkmark \]
  \[ ((a_1 b_1) - (a_2 b_2)) ((a_2 b_1) + (a_1 b_2)) \times \]
  \[ ((a_1 b_1) - (a_2 b_2)) ((a_2 b_1) + (a_1 b_2)) \checkmark \]

- Text sub/superscript in theorem-like environments and correction with \texttt{\normalfont}

\textbf{Theorem 1.}

\[ a_{right} \times \]
\[ a_{right} \checkmark \]
• subarray

\[
\sum_{i^2+j^2=50} \sum_{i, j \leq 10} \frac{x^i + y^j}{(i+j)!}
\]

substack

\[
\sum_{i<n \atop i \text{ even}} x_i^2
\]

• \texttt{\bar} and \texttt{\overline}

\begin{align*}
\bar{a} \\
\overline{\mathbf{a}}
\end{align*}

• \texttt{\mathstrut}

The formula $\sqrt{a} + \sqrt{b}$ does not look quite right, because the square roots are not uniform. You can correct this with \texttt{mathstrut} commands, which inserts an invisible vertical space: $\sqrt{a} + \sqrt{b}$. Another way to handle this situation is with the \texttt{\vphantom} (vertical phantom) command, which measures the height of its argument and places a math strut of that height into the formula: $\sqrt{a} + \sqrt{b}$.

• \texttt{\sideset}

\[
\sideset{r}{c} \prod_{i=n}^{a} i_j
\]

• \texttt{\pmb}

Bolding math symbols $\alpha$.

Bolding math alphabet $\mathbf{A}$.

\texttt{\pmb} typesets the symbol three times very close to one another producing a bold symbol of some quality for symbols with no bolds:

\[
\sum \sum \sum
\]

• \texttt{\cfrac}

\[
\cfrac{1}{2 + \cfrac{1}{3 + \cdots}} = \cfrac{1}{2 + \cfrac{1}{3 + \cdots}}
\]

• When there is a \texttt{tag}, \texttt{equation} and \texttt{equation*} both print the \texttt{tag} as the equation “number:”

\[
\int_{-\infty}^{\infty} e^{-x^2} \, dx = \sqrt{\pi} \quad \text{(Int)}
\]
\[ \int_{-\infty}^{\infty} e^{-x^2} \, dx = \sqrt{\pi} \quad \text{(Int)} \]

See (Int) on page 4.

- **subequations**
  \[ A^{[2]} \circ B^{[2]} \equiv (A \circ B)^{(2)} \quad (1a) \]
  \[ A^{(2)} \circ B^{(2)} \equiv (A \circ B)^{(2)} \quad (1b) \]
  See (1), (1a), and (1b).

- **ref in tag**
  \[ A^{(2)} \circ B^{(2)} \equiv (A \circ B)^{(2)} \quad (2) \]
  \[ A'^{(2)} \circ B'^{(2)} \equiv (A' \circ B')^{(2)} \quad (2') \]

- **\genfrac{[}{]}{0pt}{}{a}{c}**
  \[ \frac{a + b}{c} \]

- **\boxed equation**
  \[ \int_{-\infty}^{\infty} e^{-x^2} \, dx = \sqrt{\pi} \]

- **\fbox and \boxed**
  [Hello world] and [Hello world] (identical)

- **gather**
  \[ x_1 x_2 + x_1^2 x_2^2 + x_3, \]
  \[ x_1 x_3 + x_1^2 x_3^2 + x_2, \]
  \[ x_1 x_2 x_3. \]

- **multline** (N.B. There’s only one i in multline.)
  \[(x_1 x_2 x_3 x_4 x_5 x_6)^2 + (y_1 y_2 y_3 y_4 y_5 y_6 + y_1 y_2 y_3 y_4 y_5 y_6)^2 + (z_1 z_2 z_3 z_4 z_5 z_6 + z_1 z_2 z_3 z_4 z_5 z_6)^2 + (u_1 u_2 u_3 u_4 + u_1 u_2 u_3 u_5 + u_1 u_2 u_4 u_5 + u_1 u_3 u_4 u_5)^2 \quad (6) \]

- **align** and **flalign** (fl stands for flush)
  \[
  f(x) = x + yz \quad g(x) = x + y + z \quad (7) \\
  h(x) = xy + xz + yz \quad k(x) = (x + y)(x + z)(y + z) \\
  f(x) = x + yz \quad g(x) = x + y + z \quad (8) \\
  h(x) = xy + xz + yz \quad k(x) = (x + y)(x + z)(y + z) 
  \]
eqnarray and align
In the eqnarray environment the spacing is based on the spacing of the columns rather than on the spacing requirements of the symbols. Unfortunately, a large number of journal submissions still use this construct, and have to be recoded in the editorial offices. Be kind to your editor, and do not use eqnarray.

\[ x = 17y \]
\[ y > a + b + c \times \]

\[ x = 17y \]
\[ y > a + b + c \checkmark \]

alignat and align
\[
\begin{alignat}{3}
a_{11}x_1 + a_{12}x_2 + a_{13}x_3 &= y_1, \\
a_{21}x_1 + a_{22}x_2 + a_{24}x_4 &= y_2, \\
a_{31}x_1 + a_{33}x_3 + a_{34}x_4 &= y_3.
\end{alignat}
\]

\[
\begin{alignat}{3}
a_{11}x_1 + a_{12}x_2 &= y_1, \\
a_{21}x_1 + a_{22}x_2 &= y_2, \\
a_{31}x_1 &= y_3.
\end{alignat}
\]

\verb|$\intertext$
\[
h(x) = \int \left( \frac{f(x) + g(x)}{1 + f^2(x)} + \frac{1 + f(x)g(x)}{\sqrt{1 - \sin x}} \right) dx \tag{9}\]

This line is written in the align environment
\[
= \int \frac{1 + f(x)}{1 + g(x)} \, dx - 2 \arctan(x - 2)
\]

\[
\begin{bmatrix}
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 \\
1 & 2 & 3 & \ldots & \ldots & \ldots & \ldots & \ldots & \ldots & \ldots & 11 & 12
\end{bmatrix}
\]

\[
(a_{ki}) = \begin{bmatrix}
0 & \ldots & 0 \\
0 & \ldots & 0 \\
0 & \ldots & 0
\end{bmatrix}
\]

smallmatrix is used inline instead of matrix.

Compare: \[
\begin{pmatrix}
a + b + c \\ a + b \end{pmatrix}
\]
and \[
\begin{pmatrix}
\frac{a + b + c}{a+b} & uv \\
\frac{a + b}{a+b} & c + d
\end{pmatrix}
\]

This table has been made using array
\[
\begin{array}{ccc}
a & b & c \\
1 & 1 & 1 \\
2 & 1 & -1 \\
2 & 2 & 1 \\
0 & 0 & 0
\end{array}
\]
Subsidiary environments (here aligned and gathered) create “large math symbols.” There is no numbering or tag-\textsuperscript{-ing} allowed in subsidiary math environments because $\LaTeX$ does not number or tag what it considers to be a single symbol.

\[
\begin{bmatrix}
amenumber{a} & b \\
amenumber{c} & d \\
amenumber{0} & m & n \\
amenumber{0} & k & l
\end{bmatrix}
\]

\[p = 5 + a + \alpha\]
\[q = 12\]
\[r = 13\]
\[x = 3 + p + \alpha\qquad\text{using}\qquad s = 11 + d\]
\[y = 4 + q\]
\[z = 5 + r\]
\[u = 6 + s\]

\textsuperscript{\textcompwordmark}

iff and iff

\textsuperscript{\TextOrMath}

This is $\alpha$ in text, and this is $\alpha$ in math

This is $\alpha$ in text, and this is $\alpha$ in math

\textsuperscript{\textsuperscript{\textsubscript{\textsuperscript{A}}}}

and \textsuperscript{\textsubscript{\textsuperscript{\textsubscript{A}}}}

$\def\congr#1=#2(#3){#1\equiv#2\pod{#3}}$

and then $\congr{x=a}=b(\theta)$

$\LaTeX$book and $\TeX$ both typeset correctly (including the space after the latter) using a delimited command, $\def\textx{\TeX}$ then $\textx$. $\textx$ has an advantage over $\TeX$: forgetting the right delimiter, $/$, in $\textx$ produces an error message and hence the spacing cannot be messed up because of forgetting to type an explicit blank space $\ \$ after $\TeX$ when it’s needed.

$\newcommand{\BestSum}[2][n]{\#2_1+\#2_2+\cdots+\#2_{#1}}$

and then $\BestSum{a}$ and $\BestSum[m]{c}$ to produce

$\alpha_1+\alpha_2+\cdots+\alpha_n$ and $c_1+c_2+\cdots+c_m$

\bysame’s \textsuperscript{3em} line:

Name of the theorem. Body of theorem.

This is a paragraph typeset as a minipage and numbered as an equation.

\begin{align}
\textxnumber{roman}
\end{align}

Notice the change of page numbers to roman numerals starting from this page.
<table>
<thead>
<tr>
<th>Name</th>
<th>Month</th>
<th>Week</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peter</td>
<td>Jan.</td>
<td>1</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>12.78</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>0.71</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>15.00</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>29.49</td>
</tr>
<tr>
<td>John</td>
<td>Jan.</td>
<td>1</td>
<td>12.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>3.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>10.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>25.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td></td>
<td>54.70</td>
</tr>
</tbody>
</table>

Table 1. Table with \texttt{\multicolumn} and \texttt{\cline}.

\begin{verbatim}
\def\thesection{*=\Alph{section}}

\*A. This is a section with custom section “number.”
\*B. …and this is another section.
\end{verbatim}

\begin{verbatim}
\def\vect<#1>{\ensuremath{\langle #1 \rangle}}
and then \texttt{\vect<a,b>} to produce \langle a,b \rangle.
\end{verbatim}

\begin{verbatim}
\texttt{C/MATLAB code (inline and displayed)}
\texttt{for i=1:3, disp(’cool’); end;}
\end{verbatim}

\begin{verbatim}
\texttt{\begin{verbatim}
for i=1:3
124 disp(’This is a string’); Some \LaTeX\ in here: $x^2$
126 x_last = x(end); % Math in comment $x^2$
128 \% literate option (in listings package) active
dfdx \neq \Delta f/\Delta x;
\% x_last = x(end);
132 \% x_last = x(end);
\%
134 This
136 \{ Block comment
138 end
\end{verbatim}}
\end{verbatim}

Listing 1. Caption with label
Line 129 in Listing 1 is written “literately.” Include an external m-file using `\lstinputlisting{/path/to/filename.m}`.

```
#include <stdio.h>

int main(int argc, char ** argv)
{
    printf("Hello\world!\n");
    return 0;
}
```

• tabbing
  
  \begin{verbatim}
  k := 1
  l_k := 0; r_k := 1
  loop
    m_k := (l_k + r_k)/2
    if w < m_k then
      b_k := 0; r_k := m_k
    else if w > m_k then
      b_k := 1; l_k := m_k
    end if
    k := k + 1
  end loop
  \end{verbatim}

(Matlabician) Somewhere, Over the Rainbow

URL: http://www.Matlabician.com