LaTeX’s default spacing for integrals may not be desirable:

\[
\int_{\Omega} \nabla \cdot F \, dV \quad \text{(no spacing)}
\]
\[
\int_{\Omega} \nabla \cdot F \, dV \quad (\backslash, \text{ before } d)
\]
\[
\int_{\Omega} \nabla \cdot F \, dV \quad (\backslash! \text{ after } \int, \backslash, \text{ before } d, \text{ mathrm on } d)
\]

\[
\oint_{\Phi} \int_{V} \int_{W} f(x) \, dx \, dy \, dz, \quad \oint_{\Phi} \int_{V} \int_{W} f(x) \, dx \, dy \, dz
\]

Note: \texttt{\textbackslash mathrm} renders symbols as text \textit{while staying in math mode}, while \texttt{\textbackslash text} returns to text mode.
Units

Typeset units using a package such as \texttt{siunitx} rather than directly.

\begin{align*}
g &= \SI{9.8}{\text{kg}\cdot\text{m}/\text{s}^2} \quad \text{or} \quad g = 9.8 \, \text{kg} \, \text{m} / \text{s}^2 \\
g &= 9.8 \text{\,kg\,m/s}^2
\end{align*}

\[
\text{St} = \frac{fL}{U} = \frac{(5.1 \, \text{s}^{-1})(3.4 \times 10^{-1} \, \text{m})}{7.1 \, \text{m/s}} = 0.244
\]

Bold symbols

Bold and italics do not always interact in the obvious way:

\begin{align*}
\textbf{boldsymbol}{\mathbf{\mu g}} & \quad \mu g \\
\textbf{mathbf{\mu g}} & \quad \mu g
\end{align*}

Avoid $\textbf{bf}$. Use the above or $\textbf{bm}$ from the \texttt{bm} package.
The listings package provides an environment for displaying code with syntax highlighting and many customization options for most languages (TeX, C++, MATLAB...)

%Code from the last slide
\begin{table}
\begin{tabular}{c|c}
\lstinline$\boldsymbol{\mu g}$ & $\boldsymbol{\mu g}$ \\
\lstinline$\mathbf{\mu g}$ & $\mathbf{\mu g}$ \\
\lstinline$\boldsymbol{\mu g}$ & $\boldsymbol{\mu g}$ \\
\lstinline$\mathbf{\mu g}$ & $\mathbf{\mu g}$ \\
\end{tabular}
\end{table}
More fonts and symbols

Lookup symbols by drawing:
http://detexify.kirelabs.org/classify.html

More math fonts:

<table>
<thead>
<tr>
<th>Normal</th>
<th>-</th>
<th>ABCDEFG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td>\textbb</td>
<td>NZQR</td>
</tr>
<tr>
<td>Calligraphy</td>
<td>\mathcal</td>
<td>ABCDEFG</td>
</tr>
<tr>
<td>Fancy script</td>
<td>\mathscr\textsuperscript{a}</td>
<td>A B C D E F G</td>
</tr>
<tr>
<td>Fraktur</td>
<td>\textfrak</td>
<td>abcdefg</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Requires \texttt{mathrsfs} or \texttt{rsfsso}
Define with \texttt{newcommand}\name[x]\{...\}
\texttt{newcommand}\od[2]\{\frac{d#1}{d#2}\}
- $x$ is the number of arguments
- $#1$, $#2$ : arguments in command
- Put in preamble (before \texttt{begin}\{document\})

Warning
Substitution may not work as expected (or at all):
\texttt{newcommand}\verb[1]\{\texttt{begin}\{verbatim\}#1\texttt{end}\{verbatim\}}
Result: error!
Defining new operators

amsmath includes some options for new math operators like \lim and \sin that use the correct spacing and can take limits.

With \newcommand:

\newcommand{\argmin}{\underset{#1}{\arg\min},}
\argmin{x,z} L(x,z,y)

\[ \arg \min_{x,z} L(x,z,y) \]

Easier:

\DeclareMathOperator*\argmin{arg\,,\min}
\argmin_{x,z} L(x,z,y)

\[ \arg \min_{x,z} L(x,z,y) \]
Defining new operators

Inner products with $\langle \psi, \psi \rangle$, $\langle \sum_{i=1}^{n} v_i, \sum_{j=1}^{n} v_j \rangle$

Can define using \texttt{DeclarePairedDelimiter} from \texttt{mathtools}. 
Shorthand

Look for packages that define shorthand (physics and commath are two options). Avoid making your code too unreadable!

Common definitions

- Partial derivatives: \( \frac{\partial f}{\partial x} \)
  \newcommand\pd[2]{\frac{\partial #1}{\partial #2}}

- Vectors (bold)
  \newcommand\bv[#1]{\mathbf{#1}}

- More vectors: \( \Va \), \( \Vb \), \( \Vv \)
  \newcommand\Va{\mathbf{Va}}

- Short text in math mode: \quad\text{#1}\quad
  \[ f(x) = 0 \quad \text{for} \quad x \in V \]

Curly braces can be omitted for single objects, e.g. \bv \ x \ for \ x.
The hyperref package creates hyperlinks in PDFs

By (1), it follows that... (using \texttt{\textbackslash eqref}[[label]])

By Eq. 1, ... (using Eq.~\texttt{\textbackslash eqref}[[label]])

hyperref can be found here

Many more powerful reference commands exist (e.g. \texttt{\textbackslash autoref} in hyperref or the package cleveref)