Scientific Computing 372

LATEX: Section 3

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Admin

Including other files

Example (Including files in a document)

- Use `\include{`⟨file⟩`}` and `\includeonly{`⟨file list⟩`}`.

```
\documentclass[a4paper]{book}
\includeonly{intro,chap1,chap3,close}
\title{My Most Excellent Monograph}
\author{W. H. K. Bester}
\begin{document}
\maketitle
\tableofcontents
\include{intro}
\include{chap1}
\include{chap2}
\include{chap3}
\include{close}
\end{document}
```

Environments

Environments

- Between `\begin{`⟨env⟩`}` and `\end{`⟨env⟩`}`
- The whole document, excluding the preamble, is an environment
- Standard environments include those for:
    - **Displayed paragraphs**: quotations, centred text, verses, or verbatim text
    - **Lists**: itemised, enumerated, or descriptive
    - **Maths**: equations and theorems
    - **Tabular data**: tables and arrays
    - **Floating structures**: pictures, floats, and figures

Displayed paragraphs

Example (Centred text)

- Use the *center* environment

```
This text is normal.
\begin{center}
This one is centred.

And this one.
\end{center}
This one is normal again.
```

This text is normal.

<div align="center">This one is centred.
And this one.</div>

This one is normal again.

Example (Quotations)

- Use the *quote* or *quotation* environments

```
My favourite quotation is:
\begin{quote} Sic
gorgiamus allus
subiectatus nunc.
\end{quote}
```

My favourite quotation is:

> *Sic gorgiamus allus subiectatus nunc.*

Displayed paragraphs

Example (Verses)

- Use the *verse* environment
- Note the use of \\ to end a line

```
By e.e.  cummings
\begin{verse}
since feeling is first \\
who pays any attention \\
to the syntax of things \\
will never wholly kiss
you; \\
\end{verse}
```

By e.e. cummings

> *since feeling is first*
> *who pays any*
> *   attention*
> *to the syntax of*
> *   things*
> *will never wholly kiss*
> *   you;*

Verbatim text

Simulating typed text

- Use the *verbatim* or *verbatim** environments
- Use the `\verb` command; note delimiters

Example (Verbatim text)

```
\begin{verbatim}
What the   #%|&$_\^~   is
  ``going'' {on}   here
 \today  \\\???????
\end{verbatim}
```

```
What the   #%|&$_\^~   is
  ``going'' {on}   here
 \today  \\\???????
```

Example (Verbatim text)

```
\begin{verbatim*}
The \LaTeX command
\end{verbatim*}
```
The `\verb+&$+` and `\verb73\7`
are silly.

```
The␣\LaTeX␣command
```

The &$ and 3\ are silly.

Lists

Example (Itemised lists)

- Use the *itemize* environment

```
Here is an itemised list:
\begin{itemize}
\item First item
\item Second item
\item Another item
\end{itemize}
As easy as this!
```

Here is an itemised list:

- First item
- Second item
- Another item

As easy as this!

Lists

Example (Enumerated lists)

- Use the *enumerate* environment

```
Enumerated lists are just as
easy to make:
\begin{enumerate}
\item First item
\item Second item
\item Another item
\end{enumerate}
As easy as this!
```

Enumerated lists are just as easy to make:

1. First item
2. Second item
3. Another item

As easy as this!

Lists

Example (Nested lists)

```
\begin{enumerate}
\item Item
\begin{enumerate}
\item Subitem
\item Another subitem
\begin{enumerate}
\item But yet
\item it moves
\item again
\end{enumerate}
\item Continuing
\item Until here
\end{enumerate}
\item Another item
\item Last item
\end{enumerate}
```

1. Item
   (a) Subitem
   (b) Another subitem
         i. But yet
        ii. it moves
       iii. again
   (c) Continuing
   (d) Until here
2. Another item
3. Last item

Lists

Example (Description lists)

- Use the *description* environment

```
Some animals explained.
\begin{description}
\item[Porcupine] An animal
with many sharp things on
its back.
\item[Rabbit] A fast
animal with long ears.
\end{description}
```

Some animals explained.

Porcupine An animal with many sharp things on its back.

Rabbit A fast animal with long ears.

Numbered equations and references

Numbered equations

- You already know how to use the math mode
- Either in running text
- Or as displayed mathematics
- Equations can be numbered automatically
- Use the *equation* environment

References

- Use \label{⟨name⟩} to give an environment (or section or item) a name
- Use \ref{⟨name⟩} to get the "number" of ⟨name⟩
- These numbers are updated automatically

Mathematics and references

Example (References to equations)

```
The length of the curve
$y = y(x)$ is therefore
\begin{equation}
\label{length}
L = \int_{a}^{b} \sqrt{1
+ \left(\frac{dy}{dx}
\right)^{2}} dx.
\end{equation}
When we now differentiate
(\ref{length}) with respect
to $x$, it follows \ldots
```

The length of the curve $y = y(x)$ is therefore

$$L = \int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx. \qquad (1)$$

When we now differentiate (1) with respect to x, it follows $\ldots$

Equation arrays

Example (Systems of equations)

```
The linear system
\begin{eqnarray}
a_{11}x_{1}+\ldots+a_{1n}x_{x}
& = & b_{1} \nonumber \\
\vdots & & \vdots \nonumber \\
a_{n1}x_{1}+\ldots+a_{nn}x_{x}
& = & b_{n}
\end{eqnarray}
may now be \ldots
```

The linear system

$$
\begin{array}{rcl}
a_{11}x_1 + \ldots + a_{1n}x_x & = & b_1 \\
\vdots & & \vdots \\
a_{n1}x_1 + \ldots + a_{nn}x_x & = & b_n
\end{array} \qquad (2)
$$

may now be $\ldots$

Equation arrays

Example (Long equations)

```
The compound Simpson rule for numerical integration is
\begin{eqnarray}
\int_{a}^{b}f(x)\ dx & = & -\frac{(b-a)h^{4}}{180}
f^{(iv)}(\mu)+\frac{h}{3}\left[f(a)+2\sum_{j=1}^{m-1}
f(x_{2j})\right. \nonumber \\
& & \left.+\ 4\sum_{j=1}^{m}f(x_{2j-1})+f(b)\right]
\label{simpson}
\end{eqnarray}
```

The compound Simpson rule for numerical integration is

$$\int_{a}^{b} f(x)\ dx \quad = \quad -\frac{(b-a)h^4}{180}f^{(iv)}(\mu) + \frac{h}{3}\left[f(a) + 2\sum_{j=1}^{m-1} f(x_{2j})\right.$$
$$\left. + 4\sum_{j=1}^{m} f(x_{2j-1}) + f(b)\right] \tag{3}$$