L3cture app

As usual, if you have access to the L3cture app, connect to Eduroam wifi with your standard university username and password and start it.

If you haven't got a smartphone, or don't want to take part, that's fine.

If you receive any error messages using the app, taking a screenshot and emailing it to me would be very helpful!

Fixing LaTeX errors

LaTeX documents often cause error messages

LaTeX documents often cause error messages and sometimes things can go wrong with the installation of the software.

LaTeX documents often cause error messages and sometimes things can go wrong with the installation of the software.

Getting used to error messages and fixing problems is very useful.

MiKTeX's package manager

Packages are called using the `\usepackage` command in the preamble.

Packages are called using the `\usepackage` command in the preamble. The first time a package is used, the computer will install it.

Packages are called using the `\usepackage` command in the preamble. The first time a package is used, the computer will install it.

Installing a package can take time, and interrupting the installation can lead to problems.

Packages are called using the `\usepackage` command in the preamble. The first time a package is used, the computer will install it.

Installing a package can take time, and interrupting the installation can lead to problems.

One thing to try if you have problems with a package on your own computer is starting the Package Manager, found (on Windows) at

Packages are called using the `\usepackage` command in the preamble. The first time a package is used, the computer will install it.

Installing a package can take time, and interrupting the installation can lead to problems.

One thing to try if you have problems with a package on your own computer is starting the Package Manager, found (on Windows) at

All Programs,

Packages are called using the `\usepackage` command in the preamble. The first time a package is used, the computer will install it.

Installing a package can take time, and interrupting the installation can lead to problems.

One thing to try if you have problems with a package on your own computer is starting the Package Manager, found (on Windows) at

All Programs, MiKTeX,

Packages are called using the `\usepackage` command in the preamble. The first time a package is used, the computer will install it.

Installing a package can take time, and interrupting the installation can lead to problems.

One thing to try if you have problems with a package on your own computer is starting the Package Manager, found (on Windows) at

All Programs, MiKTeX, Maintenance(Admin),

Packages are called using the `\usepackage` command in the preamble. The first time a package is used, the computer will install it.

Installing a package can take time, and interrupting the installation can lead to problems.

One thing to try if you have problems with a package on your own computer is starting the Package Manager, found (on Windows) at

All Programs, MiKTeX, Maintenance(Admin), Package Manager (Admin).

Packages are called using the `\usepackage` command in the preamble. The first time a package is used, the computer will install it.

Installing a package can take time, and interrupting the installation can lead to problems.

One thing to try if you have problems with a package on your own computer is starting the Package Manager, found (on Windows) at

All Programs, MiKTeX, Maintenance(Admin), Package Manager (Admin).

(Mac users should find a similar package manager.)

Packages are called using the `\usepackage` command in the preamble. The first time a package is used, the computer will install it.

Installing a package can take time, and interrupting the installation can lead to problems.

One thing to try if you have problems with a package on your own computer is starting the Package Manager, found (on Windows) at

All Programs, MiKTeX, Maintenance(Admin), Package Manager (Admin).

(Mac users should find a similar package manager.)

Here you can uninstall and reinstall packages.

Packages are called using the `\usepackage` command in the preamble. The first time a package is used, the computer will install it.

Installing a package can take time, and interrupting the installation can lead to problems.

One thing to try if you have problems with a package on your own computer is starting the Package Manager, found (on Windows) at

All Programs, MiKTeX, Maintenance(Admin), Package Manager (Admin).

(Mac users should find a similar package manager.)

Here you can uninstall and reinstall packages. If that doesn't help, you can always uninstall and reinstall MiKTeX.

LaTeX errors

Most often, errors are just due to bad LaTeX code.

Most often, errors are just due to bad LaTeX code. Error messages show at the bottom of the screen when you process the document.

Most often, errors are just due to bad LaTeX code. Error messages show at the bottom of the screen when you process the document.

Unfortunately, LaTeX's error messages aren't always clear.

```
! Missing $ inserted.
<inserted text>
                $
l.55 \item Let f(x) = a_
                          0+a_1x+a_2x^2+
                             a_3x^3 and $g(
                             x) = b_0+b_1x+
                             b_2x^2$. F...
I've inserted a begin-math/end-math
   symbol since I think you left one out.
```

```
! Missing $ inserted.
<inserted text>
                $
l.55 \item Let f(x) = a_
                          0+a_1x+a_2x^2+
                             a_3x^3 and $g(
                             x) = b_0+b_1x+
                             b_2x^2$. F...
I've inserted a begin-math/end-math
   symbol since I think you left one out.
```

This is maths symbols used not in math-mode (in this case, the _ symbol).

```
! LaTeX Error: \begin{enumerate} on input
    line 74 ended by \end{document}.

See the LaTeX manual or LaTeX Companion
   for explanation.
Type  H <return>  for immediate help.
 ...
```

```
! LaTeX Error: \begin{enumerate} on input
    line 74 ended by \end{document}.

See the LaTeX manual or LaTeX Companion
   for explanation.
Type  H <return>  for immediate help.
 ...
```

This is a forgotten \end{enumerate}.

```
Runaway argument?
{Maclaurin and Taylor series, drawing
   attention to the $x-a$ in the d\ETC.
! File ended while scanning use of \emph
   .
<inserted text>
                  \par
<*> ...10*Maclaurin*series/10
   _maclaurin_series.tex

I suspect you have forgotten a `}',
   causing me to read past where you
   wanted me to stop.
```

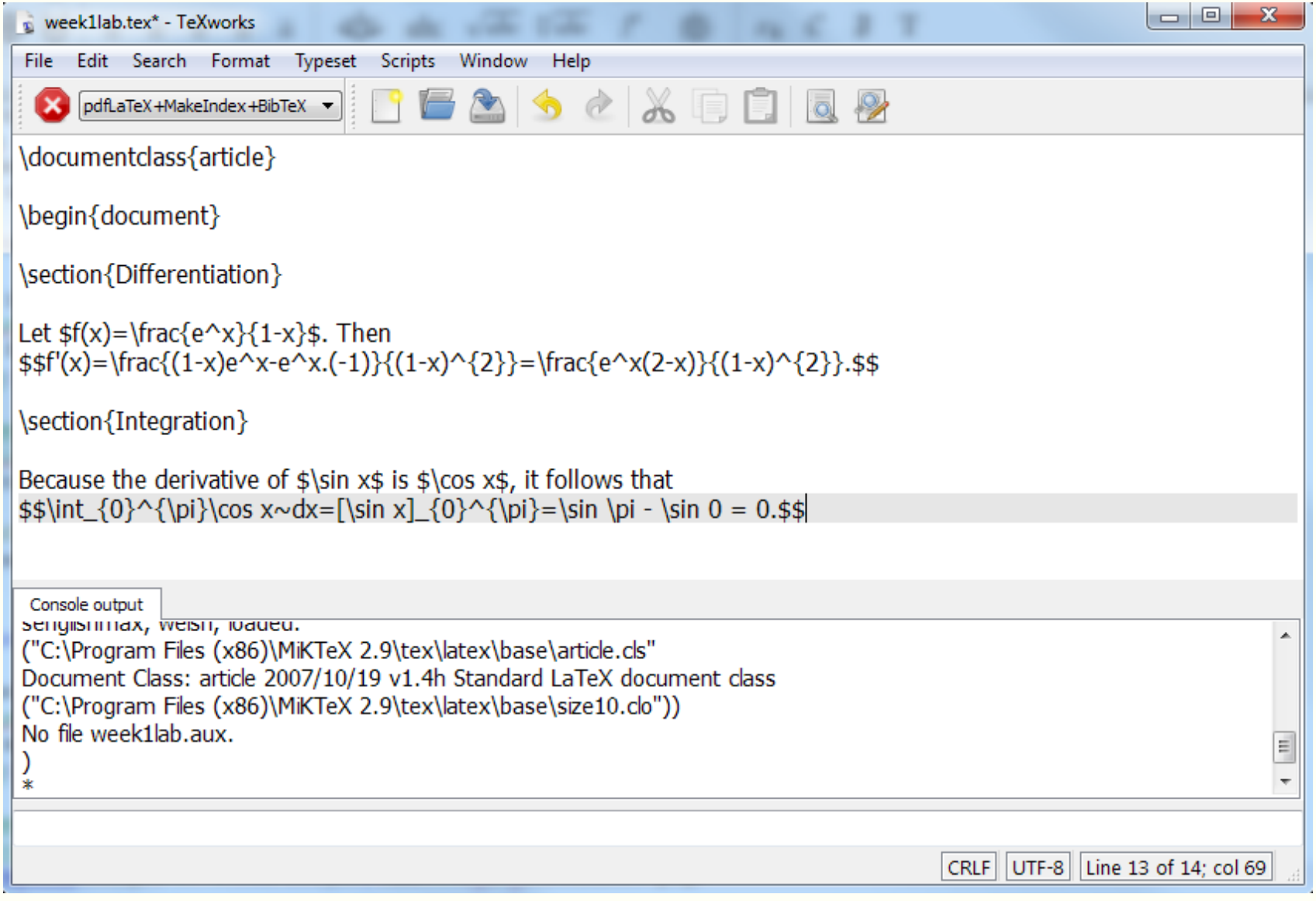
```
Runaway argument?
{Maclaurin and Taylor series, drawing
   attention to the $x-a$ in the d\ETC.
! File ended while scanning use of \emph
   .
<inserted text>
                  \par
<*> ...10*Maclaurin*series/10
   _maclaurin_series.tex

I suspect you have forgotten a `}',
   causing me to read past where you
   wanted me to stop.
```

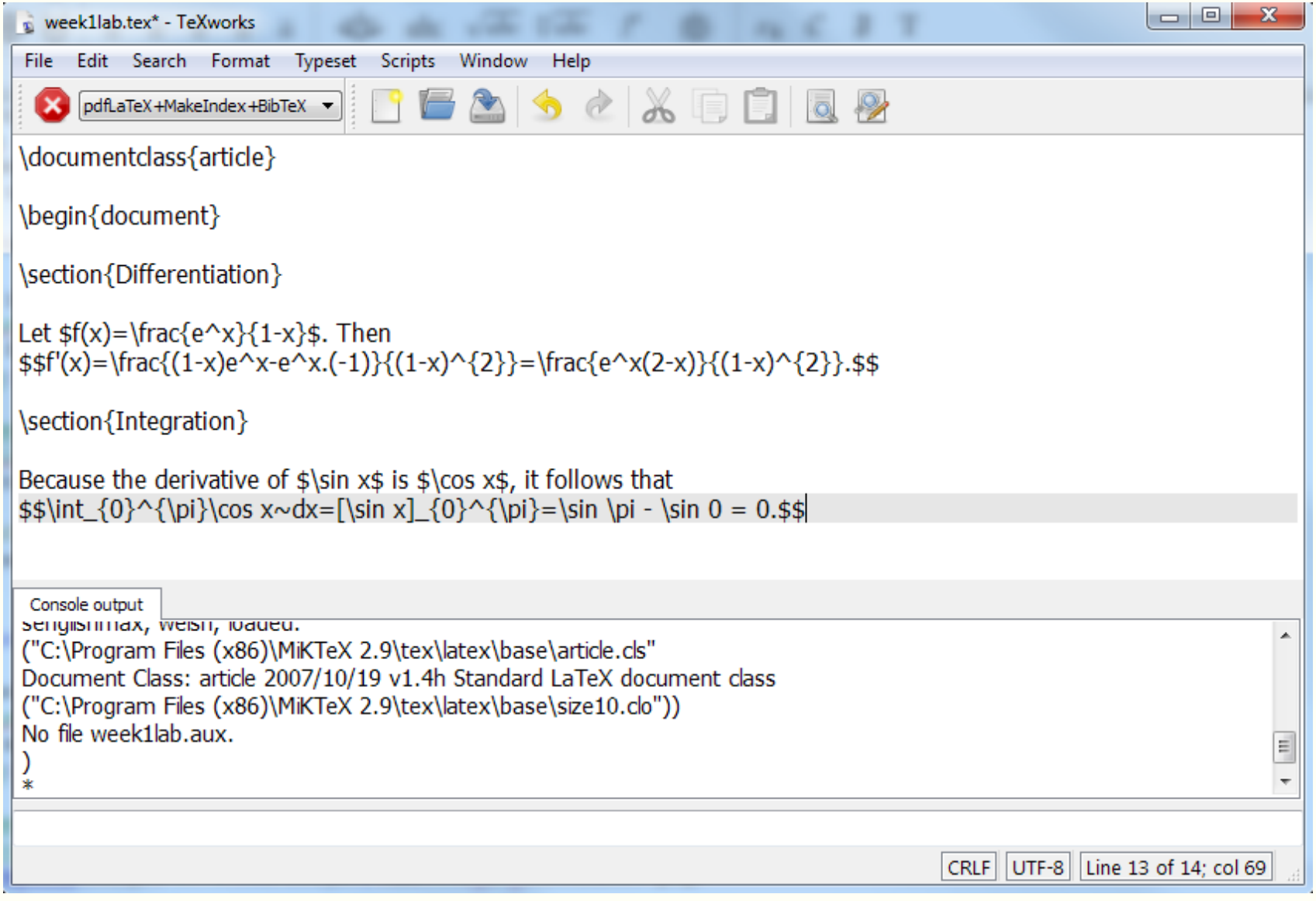
This is a forgotten }.

```
! LaTeX Error: Environment enumreate
   undefined.

See the LaTeX manual or LaTeX Companion
   for explanation.
Type  H <return>  for immediate help.
 ...

l.54 \begin{enumreate}

Your command was ignored.
```

```
! LaTeX Error: Environment enumreate
   undefined.

See the LaTeX manual or LaTeX Companion
   for explanation.
Type  H <return>  for immediate help.
 ...

l.54 \begin{enumreate}

Your command was ignored.
```

This is a misspelling of ‘enumerate’.


week1lab.tex* - TeXworks
File Edit Search Format Typeset Scripts Window Help
pdfLaTeX+MakeIndex+BibTeX
\documentclass{article}
\begin{document}
\section{Differentiation}
Let $f(x)=\frac{e^x}{1-x}$. Then
$$f'(x)=\frac{(1-x)e^x-e^x.(-1)}{(1-x)^{2}}=\frac{e^x(2-x)}{(1-x)^{2}}.$$
\section{Integration}
Because the derivative of $\sin x$ is $\cos x$, it follows that
$$\int_{0}^{\pi}\cos x~dx=[\sin x]_{0}^{\pi}=\sin \pi - \sin 0 = 0.$$
Console output
("C:\Program Files (x86)\MiKTeX 2.9\tex\latex\base\article.cls"
Document Class: article 2007/10/19 v1.4h Standard LaTeX document class
("C:\Program Files (x86)\MiKTeX 2.9\tex\latex\base\size10.clo"))
No file week1lab.aux.
)
*
CRLF
UTF-8
Line 13 of 14; col 69



This is a missing `\end{document}`.

Most LaTeX errors will be one of the above.

The University PCs

If things stop working on the University's PCs, follow the instructions on the course webpage in the 'Extras' section.

If things stop working on the University's PCs, follow the instructions on the course webpage in the 'Extras' section. The advice there resets the installation.

If things stop working on the University's PCs, follow the instructions on the course webpage in the 'Extras' section. The advice there resets the installation.

(This advice is specific to the University computers, though, and won't work on your own computer.)

Common LaTeX let-downs

Activity. The circulated document (also on the course website) comes with a number of factors making it below par. In pairs, find as many ways of improving the document as you can.

Before we identify the errors in the document, let's discuss some common problems.

Maths not in math-mode

Maths not in math-mode

When using inline maths, it is easy to forget the single dollars.

Maths not in math-mode

When using inline maths, it is easy to forget the single dollars.
Look out for maths symbols not displayed in italics.

Maths not in math-mode

When using inline maths, it is easy to forget the single dollars. Look out for maths symbols not displayed in italics.

Examples.

This x is correct, whereas this x is not.

Maths not in math-mode

When using inline maths, it is easy to forget the single dollars. Look out for maths symbols not displayed in italics.

Examples.

This x is correct, whereas this x is not. This f(x) is wrong as well,

Maths not in math-mode

When using inline maths, it is easy to forget the single dollars. Look out for maths symbols not displayed in italics.

Examples.

This x is correct, whereas this x is not. This f(x) is wrong as well, as is this set A, which is better as A.

Text in math-mode

Text in math-mode

The reverse situation is using text in math-mode.

Text in math-mode

The reverse situation is using text in math-mode. This is easy to spot, as the text becomes italic and spacing isn't correct.

Text in math-mode

The reverse situation is using text in math-mode. This is easy to spot, as the text becomes italic and spacing isn't correct.

Examples.

$Thistextisinmath - mode$.

Text in math-mode

The reverse situation is using text in math-mode. This is easy to spot, as the text becomes italic and spacing isn't correct.

Examples.

$Thistextisinmath - mode.$

$This\ line\ is\ also\ in\ math - mode,\ with\ \sim\ used\ for\ spaces.$

Text in math-mode

The reverse situation is using text in math-mode. This is easy to spot, as the text becomes italic and spacing isn't correct.

Examples.

$Thistextisinmath - mode.$

$This\ line\ is\ also\ in\ math - mode,\ with\ \sim\ used\ for\ spaces.$

The first case here may have happened by accident.

Text in math-mode

The reverse situation is using text in math-mode. This is easy to spot, as the text becomes italic and spacing isn't correct.

Examples.

$Thistextisinmath-mode.$

$This\ line\ is\ also\ in\ math-mode,\ with\ \sim\ used\ for\ spaces.$

The first case here may have happened by accident. The second is someone fiddling to make things look OK, but is bad practice.

It is rare that text is needed within math-mode, but if it's unavoidable, use the `\text{...}` command.

It is rare that text is needed within math-mode, but if it's unavoidable, use the `\text{...}` command.

Example.

The `\text` command allows us to write

$$x = u + v \quad \text{and} \quad y = u - v.$$

It is rare that text is needed within math-mode, but if it's unavoidable, use the `\text{...}` command.

Example.

The `\text` command allows us to write

$$x = u + v \quad \text{and} \quad y = u - v.$$

Notice the spacing between the maths and text.

It is rare that text is needed within math-mode, but if it's unavoidable, use the `\text{...}` command.

Example.

The `\text` command allows us to write

$$x = u + v \quad \text{and} \quad y = u - v.$$

Notice the spacing between the maths and text. This has been done using the `\quad` command, which creates a large space:

It is rare that text is needed within math-mode, but if it's unavoidable, use the `\text{...}` command.

Example.

The `\text` command allows us to write

$$x = u + v \quad \text{and} \quad y = u - v.$$

Notice the spacing between the maths and text. This has been done using the `\quad` command, which creates a large space:

```
$$x=u+v\quad\text{and}\quad y=u-v.$$
```

It is rare that text is needed within math-mode, but if it's unavoidable, use the `\text{...}` command.

Example.

The `\text` command allows us to write

$$x = u + v \quad \text{and} \quad y = u - v.$$

Notice the spacing between the maths and text. This has been done using the `\quad` command, which creates a large space:

```
$$x=u+v\quad\text{and}\quad y=u-v.$$
```

The `\text` command needs the `amsmath` package.

Punctuation in the wrong place

Punctuation in display-math (that is, $$) can sometimes slip to the next line.

Punctuation in the wrong place

Punctuation in display-math (that is, $$) can sometimes slip to the next line.

Example.

Thus,

$$\sin^2 x + \cos^2 x = 1$$

Punctuation in the wrong place

Punctuation in display-math (that is, $$) can sometimes slip to the next line.

Example.

Thus,

$$\sin^2 x + \cos^2 x = 1$$

.

Punctuation in the wrong place

Punctuation in display-math (that is, $$) can sometimes slip to the next line.

Example.

Thus,

$$\sin^2 x + \cos^2 x = 1$$

.

If using display-math, the punctuation must go inside the $$.

Punctuation in the wrong place

Punctuation in display-math (that is, $$) can sometimes slip to the next line.

Example.

Thus,

$$\sin^2 x + \cos^2 x = 1$$

.

If using display-math, the punctuation must go inside the $$. This ensures it stays on the same line, as in

Punctuation in the wrong place

Punctuation in display-math (that is, $$) can sometimes slip to the next line.

Example.

Thus,

$$\sin^2 x + \cos^2 x = 1$$

.

If using display-math, the punctuation must go inside the $$. This ensures it stays on the same line, as in

Thus,

$$\sin^2 x + \cos^2 x = 1$$

Punctuation in the wrong place

Punctuation in display-math (that is, $$) can sometimes slip to the next line.

Example.

Thus,

$$\sin^2 x + \cos^2 x = 1$$

.

If using display-math, the punctuation must go inside the $$. This ensures it stays on the same line, as in

Thus,

$$\sin^2 x + \cos^2 x = 1.$$

Conversely, it is better to put punctuation outside of single-dollars.

Conversely, it is better to put punctuation outside of single-dollars. This helps with readability of the LaTeX file.

Conversely, it is better to put punctuation outside of single-dollars. This helps with readability of the LaTeX file. The document displays the same either way in this case.

Conversely, it is better to put punctuation outside of single-dollars. This helps with readability of the LaTeX file. The document displays the same either way in this case.

Example.

```
Therefore $x=2$.
```

Conversely, it is better to put punctuation outside of single-dollars. This helps with readability of the LaTeX file. The document displays the same either way in this case.

Example.

```
Therefore $x=2$.
```

is preferred to

```
Therefore $x=2.$
```

Conversely, it is better to put punctuation outside of single-dollars. This helps with readability of the LaTeX file. The document displays the same either way in this case.

Example.

```
Therefore $x=2$.
```

is preferred to

```
Therefore $x=2.$
```

Both display as

Therefore $x = 2$.

Using too many paragraphs

Some people have a habit of starting each new sentence as a new paragraph.

Using too many paragraphs

Some people have a habit of starting each new sentence as a new paragraph. (Remember, a new paragraph in LaTeX is achieved with a blank line space.)

Using too many paragraphs

Some people have a habit of starting each new sentence as a new paragraph. (Remember, a new paragraph in LaTeX is achieved with a blank line space.) This can make the text hard to read quickly.

Using too many paragraphs

Some people have a habit of starting each new sentence as a new paragraph. (Remember, a new paragraph in LaTeX is achieved with a blank line space.) This can make the text hard to read quickly.

Try to use paragraphs appropriately, with each new paragraph representing a change of idea or step forward.

Example.

Let $y = e^x \cos x$.

Differentiating, $\frac{dy}{dx} = e^x(\cos x - \sin x)$.

Thus, $\frac{dy}{dx} = 0$ if and only if $e^x(\cos x - \sin x) = 0$.

Since $e^x > 0$ for all x, it follows that...

Example.

Let $y = e^x \cos x$.

Differentiating, $\frac{dy}{dx} = e^x(\cos x - \sin x)$.

Thus, $\frac{dy}{dx} = 0$ if and only if $e^x(\cos x - \sin x) = 0$.

Since $e^x > 0$ for all x, it follows that...

Is better as

Let $y = e^x \cos x$. Differentiating, $\frac{dy}{dx} = e^x(\cos x - \sin x)$. Thus, $\frac{dy}{dx} = 0$ if and only if $e^x(\cos x - \sin x) = 0$. Since $e^x > 0$ for all x, it follows that...

Using too much display-math

Beginners to LaTeX often overuse display-math ($$).

Using too much display-math

Beginners to LaTeX often overuse display-math ($$).

Display-math should be used for important steps that you would like to stand out, or for formulas and equations too big to display well in-line.

Using too much display-math

Beginners to LaTeX often overuse display-math ($$).

Display-math should be used for important steps that you would like to stand out, or for formulas and equations too big to display well in-line.

Too much display-math slows the reader down.

Using too much display-math

Beginners to LaTeX often overuse display-math ($$).

Display-math should be used for important steps that you would like to stand out, or for formulas and equations too big to display well in-line.

Too much display-math slows the reader down.

Here's an example of something broken up too much by display-math.

Example.

Suppose not, and $\sqrt{2}$ is rational. Then, by Lemma 1.2,

$$\sqrt{2} = \frac{a}{b},$$

where a and b share no common factors. Thus, squaring,

$$2b^2 = a^2.$$

It follows that a^2 is even, and hence so is a. Write

$$a = 2m$$

for some $m \in \mathbb{Z}$...

Re-write: Suppose not, and $\sqrt{2}$ is rational. Then, by Lemma 1.2, $\sqrt{2} = \frac{a}{b}$, where a and b share no common factors. Thus, squaring, $2b^2 = a^2$. It follows that a^2 is even, and hence so is a. Write $a = 2m$ for some $m \in \mathbb{Z}$...

Not writing in full sentences

Mathematicians often try to save time when writing by hand,

Not writing in full sentences

Mathematicians often try to save time when writing by hand, adding little notes, and these might not be written in full sentences.

Not writing in full sentences

Mathematicians often try to save time when writing by hand, adding little notes, and these might not be written in full sentences.

When typing mathematics you should write *everything* in full sentences.

Not writing in full sentences

Mathematicians often try to save time when writing by hand, adding little notes, and these might not be written in full sentences.

When typing mathematics you should write *everything* in full sentences.

Example.

If $y = \sin(x)\cos(x)$ then $y' = \cos^2(x) - \sin^2(x)$ (product rule). Sub in $x = \theta/2$. Then...

Not writing in full sentences

Mathematicians often try to save time when writing by hand, adding little notes, and these might not be written in full sentences.

When typing mathematics you should write *everything* in full sentences.

Example.

If $y = \sin(x)\cos(x)$ then $y' = \cos^2(x) - \sin^2(x)$ (product rule). Sub in $x = \theta/2$. Then...

is better as

If $y = \sin(x)\cos(x)$ then $y' = \cos^2(x) - \sin^2(x)$ (using the product rule). Substitute in $x = \theta/2$. Then...

Using bold text

As explained in an earlier lecture, LaTeX is a mark-up language.

Using bold text

As explained in an earlier lecture, LaTeX is a mark-up language. The best approach is to use LaTeX to tell the computer what kind of thing your text is, rather than specifically how to display it.

Using bold text

As explained in an earlier lecture, LaTeX is a mark-up language. The best approach is to use LaTeX to tell the computer what kind of thing your text is, rather than specifically how to display it.

Bold text is almost never used in sentences, where the `\emph{...}` command (meaning 'emphasised text') is used instead.

Using bold text

As explained in an earlier lecture, LaTeX is a mark-up language. The best approach is to use LaTeX to tell the computer what kind of thing your text is, rather than specifically how to display it.

Bold text is almost never used in sentences, where the `\emph{...}` command (meaning 'emphasised text') is used instead. Bold should be kept for, say, headings in tables or leading words such as '**Note:**...'.

Overfull hboxes

LaTeX creates documents with fully-justified text (i.e. text stretched from the left margin to the right).

Overfull hboxes

LaTeX creates documents with fully-justified text (i.e. text stretched from the left margin to the right).

Usually LaTeX does this well, and doesn't like to stretch the space between the words too much.

Overfull hboxes

LaTeX creates documents with fully-justified text (i.e. text stretched from the left margin to the right).

Usually LaTeX does this well, and doesn't like to stretch the space between the words too much. Sometimes it chooses to spill over the right margin slightly.

Overfull hboxes

LaTeX creates documents with fully-justified text (i.e. text stretched from the left margin to the right).

Usually LaTeX does this well, and doesn't like to stretch the space between the words too much. Sometimes it chooses to spill over the right margin slightly. If this happens, you will get a warning about an 'overfull hbox' in the log-file.

Example.

Overfull hboxes can happen with
loooooooooooooooooooooooooooooooooooooooooooooooooooooooo
words.

Example.

Overfull hboxes can happen with loooooooooooooooooooooooooooooooooooooooooooooooooooooooo words.

To fix this, slightly reword the sentence; usually LaTeX finds a better way to split the lines.

Example.

Overfull hboxes can happen with looooooooooooooooooooooooooooooooooooooooooooooooooooooo words.

To fix this, slightly reword the sentence; usually LaTeX finds a better way to split the lines. If the overfull hbox is very slight, you might choose to ignore it.

Unlinked references

We have used the `\label{...}` and `\ref{...}` commands to label and reference equations,

Unlinked references

We have used the `\label{...}` and `\ref{...}` commands to label and reference equations, and also `\cite{...}` command to reference a book.

Unlinked references

We have used the `\label{...}` and `\ref{...}` commands to label and reference equations, and also `\cite{...}` command to reference a book.

The first time a LaTeX file is processed it displays ? instead of the correct reference number.

Unlinked references

We have used the `\label{...}` and `\ref{...}` commands to label and reference equations, and also `\cite{...}` command to reference a book.

The first time a LaTeX file is processed it displays ? instead of the correct reference number. After processing the file twice, the correct number will appear.

Unlinked references

We have used the `\label{...}` and `\ref{...}` commands to label and reference equations, and also `\cite{...}` command to reference a book.

The first time a LaTeX file is processed it displays ? instead of the correct reference number. After processing the file twice, the correct number will appear. Keep an eye out for these!

Activity. The circulated document (also on the course website) comes with a number of factors making it below par. In pairs, find as many ways of improving the document as you can.

About Computer Lab 5

In Computer Lab 5 we'll look at a few LaTeX tips and tricks that we haven't covered yet, including aligned equations, tables and more.