Graphics, Tables and Cross-References

LaTeX: A Professional Document Preparation System

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Agenda

USING COLOR IN LATEX

This topic explains how to use color in your LATEX document via the `xcolor` package which provides a set of commands for color manipulation and supports a larger number of color models.

```
\usepackage{xcolor}
```

```
This is some sample {\color{red} text with color}.
We can use many {\color{blue} built-in}
↪   {\color{violet} colors} {\color{brown} here}.
```

Output

This is some sample text with color. We can use many built-in colors here.

Named colors in xcolor package

red		lightgray
green		brown
blue		lime
cyan		olive
magenta		orange
yellow		pink
black		purple
gray		teal
white		violet
darkgray		

MORE NAMED COLORS OPTIONS

`xcolor` package options:

- dvipsnames: loads 68 named colors (CMYK)
- svgnames: loads 151 named colors (RGB)
- x11names: loads 317 named colors (RGB)

```
\usepackage[dvipsnames]{xcolor}
```

Apricot	Aquamarine	Bittersweet	Black
Blue	BlueGreen	BlueViolet	BrickRed
Brown	BurntOrange	CadetBlue	CarnationPink
Cerulean	CornflowerBlue	Cyan	Dandelion
DarkOrchid	Emerald	ForestGreen	Fuchsia
Goldenrod	Gray	Green	GreenYellow
JungleGreen	Lavender	LimeGreen	Magenta
Mahogany	Maroon	Melon	MidnightBlue
Mulberry	NavyBlue	OliveGreen	Orange
OrangeRed	Orchid	Peach	Periwinkle
PineGreen	Plum	ProcessBlue	Purple
RawSienna	Red	RedOrange	RedViolet
Rhodamine	RoyalBlue	RoyalPurple	RubineRed
Salmon	SeaGreen	Sepia	SkyBlue
SpringGreen	Tan	TealBlue	Thistle
Turquoise	Violet	VioletRed	White
WildStrawberry	Yellow	YellowGreen	YellowOrange

DEFINING YOUR OWN COLORS

```
\usepackage{xcolor}

\definecolor{mypink1}{rgb}{0.858, 0.188, 0.478}
\definecolor{mypink2}{RGB}{219, 48, 122}
\definecolor{mypink3}{cmyk}{0, 0.7808, 0.4429, 0.1412}
\definecolor{mypink4}{HTML}{F88379}
```

```
Defined color with {\color{mypink1} different color models}.
Defined color with {\color{mypink2} different color models}.
Defined color with {\color{mypink3} different color models}.
Defined color with {\color{mypink4} different color models}.
```

Output

Defined color with different color models.
Defined color with different color models.
Defined color with different color models.
Defined color with different color models.

Color Codes

Name: Thistle
Hex: #E0BBE4
RGB: (224, 187, 228)
CMYK: 0.017, 0.179, 0, 0.105

Name: Lavender Purple
Hex: #957DAD
RGB: (149, 125, 173)
CMYK: 0.138, 0.277, 0, 0.321

Name: Pastel Violet
Hex: #D291BC
RGB: (210, 145, 188)
CMYK: 0, 0.309, 0.104, 0.176

Name: Cotton Candy
Hex: #FEC8D8
RGB: (254, 200, 216)
CMYK: 0, 0.212, 0.149, 0.003

Name: Lumber
Hex: #FFDFD3
RGB: (255, 223, 211)
CMYK: 0, 0.125, 0.172, 0

Find more color codes and schemes:

- `https://www.schemecolor.com`
- `https://colorhunt.co`
- `https://htmlcolorcodes.com`
- `https://paletton.com`
- `https://coolors.co`
- `https://mycolor.space`
- `http://colormind.io`
- `https://color.adobe.com/create/color-wheel`
- `https://www.canva.com/colors/color-palettes/`

MIXING COLORS

```
\usepackage{xcolor}

\colorlet{LightRed}{red!50}
\colorlet{CottonCandy}{pink!80!blue}
```

```
This is {\color{LightRed} how we mixed colors}.

This is {\color{CottonCandy} how we mixed colors}.
```

Output

This is how we mixed colors.
This is how we mixed colors.

SETTING THE PAGE BACKGROUND COLOR

```latex
1  \documentclass{article}
2  \usepackage{xcolor}
3  \colorlet{CottonCandy}{pink!80!blue}
4
5  \begin{document}
6  \pagecolor{CottonCandy}
7  This document presents several
   ↪  examples showing how to use
   ↪  the xcolor package to change
   ↪  the color of page elements.
8  \end{document}
```

INSERTING IMAGES

```
1   \documentclass{article}
2   \usepackage{graphicx}
3   \graphicspath{ {./images/} }
4
5   \begin{document}
6   The universe is immense and
7   it seems to be homogeneous,
8   in a large scale,
9   everywhere we look at.
10
11  \includegraphics{universe.jpeg}
12
13  There's a picture of a galaxy
    ↪ above
14  \end{document}
```

The universe is immense and it seems to be homogeneous, in a large scale, everywhere we look at.

There's a picture of a galaxy above

CHANGING THE IMAGE SIZE

```
1   \documentclass{article}
2   \usepackage{graphicx}
3   \graphicspath{ {./images/} }
4
5   \begin{document}
6   The universe is immense and
7   it seems to be homogeneous,
8   in a large scale,
9   everywhere we look at.
10
11  \includegraphics[scale=0.5]
    ↪   {universe.jpeg}
12
13  There's a picture of a galaxy
    ↪   above
14  \end{document}
```

The universe is immense and it seems to be homogeneous, in a large scale, everywhere we look at.

There's a picture of a galaxy above

CHANGING THE IMAGE SIZE

```
1  \documentclass{article}
2  \usepackage{graphicx}
3  \graphicspath{ {./images/} }
4
5  \begin{document}
6  The universe is immense and
7  it seems to be homogeneous,
8  in a large scale,
9  everywhere we look at.
10
11 \includegraphics[width=4cm,
   ↪  height=2cm]
   ↪  {universe.jpeg}
12
13 There's a picture of a galaxy
   ↪  above
14 \end{document}
```

The universe is immense and it seems to be homogeneous, in a large scale, everywhere we look at.
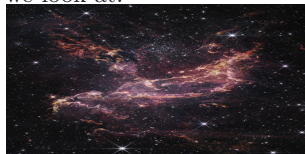
There's a picture of a galaxy above

ROTATING THE IMAGE

```latex
\documentclass{article}
\usepackage{graphicx}
\graphicspath{ {./images/} }

\begin{document}
The universe is immense and
it seems to be homogeneous,
in a large scale,
everywhere we look at.

\includegraphics[scale=0.5,
    angle=45]{universe.jpeg}

There's a picture of a galaxy
    above
\end{document}
```

The universe is immense and it seems to be homogeneous, in a large scale, everywhere we look at.

There's a picture of a galaxy above

Figures

The `figure` environment is used to display pictures as **floating elements** within the document.

- This means you include the picture inside the figure environment and you don't have to worry about it's placement.
- LaTeX will position it in a such way that it fits the flow of the document.

FIGURES

```
In this picture you can see a bar graph that shows
the results of a survey which involved some important
data studied as time passed.

\begin{figure}[t]
\includegraphics[width=8cm]{Plot.png}
\centering
\end{figure}
```
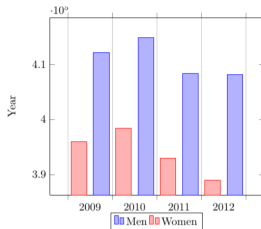

In this picture you can see a bar graph that shows the results of a survey which involved some tricky data studied as time passed.

Figure's Positionings

Parameter	Position
h	Place the float here, i.e., approximately at the same point it occurs in the source text (however, not exactly at the spot).
t	Position at the top of the page.
b	Position at the bottom of the page.
p	Put on a special page for floats only.
!	Override internal parameters LaTeX uses for determining "good" float positions.
H	Places the float at precisely the location in the LaTeX code. Requires the float package, though may cause problems occasionally. This is somewhat equivalent to h!.

Wrapping text around figures

```
\usepackage{wrapfig}
```

```
1  \begin{wrapfigure}{r}{4cm} %this will be at the right
2      \centering
3      \includegraphics[width=4cm]{mesh.png}
4  \end{wrapfigure}
5
6  There are several ways to plot a function of two variables, depending on the
↪  information you are interested in.
7  For instance, if you want to see the mesh of a function so it easier to see the
↪  derivative you can use a plot like the one on the left.
8
9  \begin{wrapfigure}{l}{4cm}
10      \centering
11      \includegraphics[width=4cm]{contour.png}
12  \end{wrapfigure}
13
14  On the other side, if you are only interested on certain values you can use the
↪  contour plot, you can use the contour plot, you can use the contour plot,
↪  you can use the contour plot, you can use the contour plot, you can use the
↪  contour plot, you can use the contour plot, like the one on the left.
```

OUTPUT

There are several ways to plot a function of two variables, depending on the information you are interested in. For instance, if you want to see the mesh of a function so it easier to see the derivative you can use a plot like the one on the left.

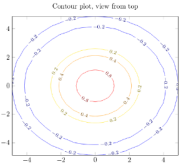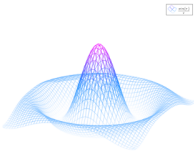On the other side, if you are only interested on certain values you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, like the one on the left.

On the other side, if you are only interested on certain values you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, like the one on the left.

On the other side, if you are only interested on certain values you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, like the one on the left.

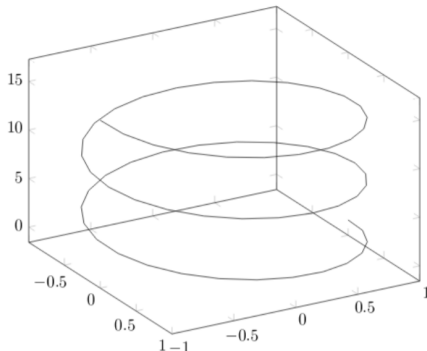# Figure's Captioning

```latex
\begin{figure}[h]
\caption{Example of a parametric plot (sin(x), cos(x), x)}
\centering
\includegraphics[width=0.5\textwidth]{spiral.png}
\end{figure}
```

Figure 1: Example of a parametric plot $(\sin(x), \cos(x), x)$

LABELS AND CROSS-REFERENCES

```latex
\begin{figure}[h]
    \centering
    \includegraphics[width=0.25\textwidth]{mesh.png}
    \caption{a nice plot}
    \label{fig:mesh1}
\end{figure}

As you can see in the figure \ref{fig:mesh1}, the
function grows near 0. Also, in the page \pageref{fig:mesh1}
is the same example.
```
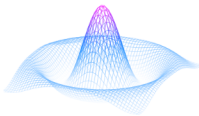

Figure 3: a nice plot

As you can see in the figure 3, the function grows near 0. Also, in the page 7 is the same example.

LIST OF FIGURES

Another great characteristic in a LaTeX document is the ability to automatically generate a list of figures. This is straightforward.

```latex
\listoffigures
```

List of Figures

This command **only works on captioned figures**.

Reference Guide: Length Abbrevation

Abbrevation	Definition
pt	A point, is the default length unit. About 0.3515mm
mm	a millimetre
cm	a centimetre
in	an inch
ex	the height of an x in the current font
em	the width of an m in the current font
\columnsep	distance between columns
\columnwidth	width of the column
\linewidth	width of the line in the current environment
\paperwidth	width of the page
\paperheight	height of the page
\textwidth	width of the text

Reference Guide: Supported Graphic Formats

Format	Recommendation
jpg/jpeg	Popular bitmap graphic format. Good choice if we want to insert photos.
png	Better quality than jpg/jpeg format and supported transparent backgrounds. However, the file size is averagely larger.
pdf	Best choice and quaity if it is sourced with vector graphic.
eps	These can be included using the `epstopdf` package (we just need to install the package, we don't need to use **\usepackage** {} to include it in our document.)

Tabular Environment

```
1  \begin{tabular}{ c c c }
2   cell1 & cell2 & cell3 \\
3   cell4 & cell5 & cell6 \\
4   cell7 & cell8 & cell9
5  \end{tabular}
```

$$
\begin{array}{ccc}
\text{cell1} & \text{cell2} & \text{cell3} \\
\text{cell4} & \text{cell5} & \text{cell6} \\
\text{cell7} & \text{cell8} & \text{cell9}
\end{array}
$$

ADDING BORDERS

```
1  \begin{tabular}{ |c|c|c| }
2   \hline
3   cell1 & cell2 & cell3 \\
4   cell4 & cell5 & cell6 \\
5   cell7 & cell8 & cell9 \\
6   \hline
7  \end{tabular}
```

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

ADDING MORE BORDERS

```latex
\begin{tabular}{ ||c c c c|| }
 \hline
 Col1 & Col2 & Col2 & Col3
 ↪ \\[0.5ex]
 \hline\hline
 1 & 6 & 87837 & 787 \\
 \hline
 2 & 7 & 78 & 5415 \\
 \hline
 3 & 545 & 778 & 7507 \\
 \hline
 4 & 545 & 18744 & 7560 \\
 \hline
 5 & 88 & 788 & 6344 \\[1ex]
 \hline
\end{tabular}
```

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

Column Aligning

Abbrevation	Alignment
c	The contents of the column will be centered.
l	The contents of the column will be left aligned.
r	The contents of the column will be right aligned.
p{xxx}	The contents of the column will be aligned as a paragraph with fixed length of text width, e.g., p{5cm} or p{0.45\textwidth }.

POSITIONING TABLES

```
1  Below is a table positioned
   ↪  exactly here:
2  \begin{table}[h!]
3  \centering
4   \begin{tabular}{||c c c c||}
5   \hline
6   Col1 & Col2 & Col2 & Col3 \\
   ↪  [0.5ex]
7   \hline\hline
8   1 & 6 & 87837 & 787 \\
9   2 & 7 & 78 & 5415 \\
10  3 & 545 & 778 & 7507 \\
11  4 & 545 & 18744 & 7560 \\
12  5 & 88 & 788 & 6344 \\ [1ex]
13  \hline
14  \end{tabular}
15 \end{table}
```

Below is a table positioned exactly here:

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

CAPTIONS AND CROSS-REFERENCES

```latex
Table \ref{table:1} is
an example of a referenced
↪  \LaTeX{} element.

\begin{table}[h!]
\centering
\begin{tabular}{|c|c|c|c|}
 \hline
 Col1 & Col2 & Col2 & Col3
 ↪  \\
 \hline
 1 & 6 & 87837 & 787 \\
 2 & 7 & 78 & 5415 \\
 3 & 545 & 778 & 7507 \\
 4 & 545 & 18744 & 7560 \\
 \hline
\end{tabular}
\caption{Table to test
↪   captions and labels.}
\label{table:1}
\end{table}
```

Table 1 is an example of a referenced LaTeX element.

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560

Table to test captions and labels.

LIST OF TABLES

To create a list of tables use the command. The caption of each table will be used to generate this list

```latex
\listoftables
```

List of Tables

This command **only works on captioned tables**.

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