

1

Lettres

$\mathbb{N}, \mathbb{Z}, \mathbb{Q}, \mathbb{R}, \mathbb{C}$	<code>\mathds{X}</code>
\mathbb{N}, \mathbb{R}	<code>{\rm I\!X}</code>
$\mathbb{N}, \mathbb{Z}, \mathbb{Q}, \mathbb{R}, \mathbb{C}$	<code>\mathbb{X}</code>
$\mathbb{N}, \mathbb{Z}, \mathbb{Q}, \mathbb{R}, \mathbb{C}$	<code>\mathbf{X}</code>
<i>ABCDEFHKL MOP SU VW</i>	<code>\mathcal{ABC}</code>
$\frac{ABCDEF\hskip 0.05em\scriptstyle\mathrm{GHIJKL MNP QRS TUVWXY Z}}{}$	<code>\mathfrak{ABC}</code>

Accentuations

Accent circonflexe (texte) $\hat{}$	<code>\string^</code>
Accent circonflexe (accent) \hat{a}	<code>\^{a}</code>
Accent circonflexe (accent)(maths) \hat{a}	<code>\hat{a}</code>
Produit vectoriel / PPCM \wedge	<code>\wedge \vee</code>
Angle genre \widehat{abc}	<code>\widehat{abc}</code>
Accent aigu \acute{a}	<code>\acute{a}</code>
(peut s'appliquer à un mot entier)	
Accent grave \grave{a}	<code>\grave{a}</code>
Barre \bar{a} $\overline{10100^2}$ (largeur fixe)	<code>\bar{a}</code>
Overline \overline{a} $\overline{10100^2}$	<code>\overline{a}</code>
Underline \underline{a} $\underline{Z = U/I}$	<code>\underline{a}</code>
Overbrace \overbrace{abc}	<code>\overbrace{abc}</code>
Underbrace \underbrace{abc}	<code>\underbrace{abc}</code>
Overset $\overset{a}{X}$ $\overset{\circ}{B}$	<code>\overset{a}{X}</code>
Underset $\underset{a}{X}$	<code>\underset{a}{X}</code>
Text overbrace $\overbrace{mainthing}^{overtex}$	<code>\overbrace{mainthing}^{overtex}</code>
Text underbrace $\underbrace{mainthing}_{undertext}$	<code>\underbrace{mainthing}_{undertext}</code>
Point \dot{x}	<code>\dot{x}</code>
Point point \ddot{x}	<code>\ddot{x}</code>
Tilde \tilde{u}	<code>\tilde{u}</code>
Widetilde \widetilde{abc}	<code>\widetilde{abc}</code>
Vecteur \overrightarrow{v} \overrightarrow{grad}	<code>\overrightarrow{grad}</code>
Vecteur \vec{v} \vec{grad} (moche)	<code>\vec{v}</code>
Produit scalaire	
$\vec{u} \cdot \vec{v}$	<code>\cdot</code>
$\vec{u} \cdot \vec{v}$	<code>\cdot</code>
$\vec{u} \bullet \vec{v}$	<code>\bullet</code>
$\overset{\circ}{A}$	<code>\circ</code> <code>\usepackage{accents}</code>

Espacements

x^2+3x+2	<code>\!</code>
x^2+3x+2	<code>[rien]</code>
x^2+3x+2	<code>[espaces]</code>
x^2+3x+2	<code>\,</code>
x^2+3x+2	<code>\:</code>
x^2+3x+2	<code>\;</code>
x^2+3x+2	<code>\</code>
x^2+3x+2	<code>\quad</code>
x^2+3x+2	<code>\quad\quad</code>

Fractions avec `\frac{}{}`

$1 + \frac{1}{1 + \frac{1}{1 + \dots}}$	$1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \dots}}}}$
---	---

Fractions avec `\cfrac{}{}`

$1 + \frac{1}{1 + \frac{1}{1 + \dots}}$	$1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \dots}}}}}$
---	---

Autres

Fonction usuelles

$\cos(x), \sin(x), \tan(x), \arccos(x), \arcsin(x), \arctan(x), \cosh(x), \sinh(x),$
 $\tanh(x), \cosh^{-1}(x), \sinh^{-1}(x), \tanh^{-1}(x), \exp(x), \ln(x), \log(x), \log_b(a)$
 $\arg(x), \dim(x), \min(a, b), \max(a, b), \gcd(a, b)$

$\cos(x), \sin(x), \tan(x), \arccos(x), \arcsin(x), \arctan(x), \cosh(x), \sinh(x),$
 $\tanh(x), \cosh^{-1}(x), \sinh^{-1}(x), \tanh^{-1}(x), \exp(x), \ln(x), \log(x), \log_b(a)$
 $\arg(x), \dim(x), \min(a, b), \max(a, b), \gcd(a, b)$

Pour d'autres fonctions : `\mathrm{PGCD}`

Pour ajouter des trucs en dessous comme ça :

$$\sum_{\substack{(x,K) \text{ tq} \\ x \in \Omega \\ K \subset I_x}} (-1)^{\text{Card}(K)}$$

`\sum_{\substack{... \\ ... \\ ...}}`

Ne pas oublier les brackets pour substack.

$$\iint_S \mu(x,y) dx dy$$

$$\oint_\Sigma$$

$$\int \bigcirc \int_{\Sigma}$$

$$\left\|\sum_{i=1}^n\lambda_ie_i\right\|$$

$$\left|\sum\ldots\right|$$

$$f(x)\rightarrow \ell$$

$$f(x)\rightarrow \ell$$

$$f(x)\not\rightarrow \ell$$

$$f(x)\xrightarrow{\hspace{3mm}} \ell$$

Changer la numérotation des part, chapter, section, etc

Déjà, dans l'ordre

```
\part
\chapter
\section
\subsection
\subsubsection
\paragraph
\subparagraph
```

Chapitre 1

Chapter

1.1 Section

1.1.1 Subsection

Subsubsection

Paragraph

Subparagraph

Et ensuite pour renommer

```
\renewcommand\thepart{\arabic{part}}  
\renewcommand\thesection{\arabic{section}}  
\renewcommand\thesubsection{\arabic{subsection}}  
\arabic : 1, 2, 3, ...  
\alph : a, b, c, ...  
\Alph : A, B, C, ...  
\roman : i, ii, iii, ...  
\Roman : I, II, III, ...
```

Systèmes d'équations

$$\begin{aligned}x + y + z &= a \\x - y &= b \\z &= c\end{aligned}$$

`\begin{align*} .. &= .. \\ .. &= .. \end{align*}`

$$\begin{array}{rcl}x + y + z & = & a \\x - y & = & b \\z & = & c\end{array}$$

`\begin{eqnarray*} .. &=& .. \\ .. &=& .. \end{eqnarray*}`

Une seule esperluette pour align, deux pour array.

Enlever les astérisques numérote les équations.

$$\left\{ \begin{array}{rcl}x + y + z & = & a \\x - y & = & b \\z & = & c\end{array} \right.$$

\$\$
\left\{
\begin{array}{r c l}
... &=& ...
... &=& ...
\end{array}
\right.
\$\$

Le point représente une **absence de délimiteurs**.

(on pourrait choisir de refermer l'accolade à droite). **Autres délimiteurs :**

$$\left(\begin{array}{rcl}x + y + z & = & a \\y - z & = & b \\z & = & c\end{array} \right) \left[\begin{array}{rcl}x + y + z & = & a \\y - z & = & b \\z & = & c\end{array} \right]$$

$$\left| \begin{array}{rcl}x + y + z & = & a \\x - y & = & b \\z & = & c\end{array} \right| \quad \left\| \begin{array}{rcl}x + y + z & = & a \\x - y & = & b \\z & = & c\end{array} \right\|$$

`\left(` `\left[` `\left|` `\left\|`

Matrices et applications

Faire une belle application (Aymeric sensei no jutsu)

$$\begin{array}{ccc} \phi & : & \mathbb{N}^* \rightarrow \mathbb{N} \\ n & \mapsto & \text{Card}\{k \in \llbracket 1, n \rrbracket, \text{pgcd}(k, n) = 1\} \end{array}$$

```
$ \begin{array}{ccccc}
f & : & \mathbb{N} & \rightarrow & \mathbb{N} \\
& & x & \mapsto & \dots
\end{array}
```

On retiendra : `\begin{array}{ccccc}`

Et mettre des esperluettes entre chaque truc, deux au début de la deuxième ligne (pour aligner f) et pas en fin de ligne

Faire des belles matrices (Aymeric sensei no jutsu)

$$\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}$$

```
$ \begin{bmatrix}
a & b & c \\
a & b & c \\
a & b & c
\end{bmatrix}
```

On retiendra : `array bmatrix`,
esperluettes entre les objets,
et on revient à la ligne avec `\\`

Il faut deux esperluettes au début de la deuxième ligne
pour que le f soit un peu décalé vers la gauche

Et sinon, un entre chaque truc, sauf en fin de ligne (y'a plus rien à aligner)

Matrices par blocs

$$\left(\begin{array}{c|c} A & B \\ \hline C & D \end{array} \right)$$

```
$ \left( \begin{array}{c|c}
A & B \\ \hline
C & D
\end{array} \right)
```

Attention aux `\\`

Autres

Saut de ligne : `\bigskip` (ne *pas* mettre en fin de ligne)

Couleurs : `\textcolor{couleur}{texte}` (`\usepackage{color}`)

Pour afficher `\!`, il faut ajouter `\!\!` entre `\` et `!`.

Pour afficher `\`, il faut ajouter `\!\!\!` entre `\` et `:`.

Pour élargir le corps du texte : `\usepackage{geometry}` `\textwidth = 426pt` (**non**)

Pour afficher certains caractères hors du math mode : `\textbullet` `\dag` `\textasteriskcentered`
(p3 de la Big Great List)

Pour encadrer : `\fbox{...}`; remettre impérativement des dollars à l'intérieur si c'est dans une équation.

Lettre grecques en math mode *uniquement*.

`\displaystyle{}` : mettre les dollars à l'extérieur.

Remarques très anecdotiques

Il y a : et colon

Autres façons de faire l'ensemble vide : `\emptyset` `\o`

`\diamond` `\surd`

`\Arrowvert`

Import de packages

Belles lettres :

`\usepackage[utf8]{inputenc}`

`\usepackage[T1]{fontenc}`

`\usepackage{lmodern}`

Français : `\usepackage[french]{babel}`

Quelques symboles de maths : `\usepackage{amsmath}`

Plus de symboles de maths : `\usepackage{amssymb}`

Belles lettres de maths : `\usepackage{dsfont}` (sans s)

Quelques polices : `\usepackage{amsfonts}` (avec s)

En particulier, cette police-là : `\texttt{...}`

SMALL CAPS : `\textsc{Small caps}`

Symboles utiles

`\newcommand{\og}{\langle}`

`\newcommand{\fg}{\rangle}`

These are provided by default in `\usepackage[french]{babel}`

Commandes

```
\newcommand{\cmdName}[numArgs][defaultValue]{substitution}  
\renewcommand{\mycommand}{Goodbye, World!}
```

Environments

```
\usepackage{amsthm}  
  
% Plain style : bold title, italic text  
\theoremstyle{plain}  
\newtheorem{theorem}{Theorem}[section]  
% "theorem" refers to the fact that  
% \begin{theorem} ... \end{theorem} must be used.  
% "Theorem" is what will be written at the beginning.  
% [section] here indicated that the counter will be reset at each \section.  
\newtheorem{lemma}[theorem]{Lemma}  
% [theorem] here indicates that the counter for lemmas  
% will be shared with the theorem's.  
\newtheorem{corollary}[theorem]{Corollary}  
% idem.  
  
% Definition style : bold title, upright text (=normal, non italic)  
\theoremstyle{definition}  
\newtheorem{definition}[theorem]{Definition}  
\newtheorem{example}[theorem]{Example}  
  
% Remark style : italic title, upright text (=normal, non italic)  
\theoremstyle{remark}  
\newtheorem*{remark}{Remark}  
% Use the starred version to have all remarks unnumbered.  
  
\begin{document}  
  
\section{Basic Concepts}  
  
\begin{definition} ... \end{definition}  
  
\begin{theorem}[Extreme Value Theorem] ... \end{proof}  
% Theorem name  
  
\begin{proof} ... \end{proof}  
% The proof environment is provided by default.  
% It adds "Proof. ... \qed".  
\end{document}
```

To get section-wise numbering :

```
\numberwithin{definition}{section}
\numberwithin{theorem}{section}
\numberwithin{corollary}{section}
\numberwithin{proposition}{section}
\numberwithin{notation}{section}
\numberwithin{remark}{section}
\numberwithin{hypothesis}{section}
```

Include other files

```
\input{filename} % Directly includes code, does not require preamble
\include{filename} % Includes code in new page, does not require preamble
```

Indent paragraphs

(suitable for books)

```
\usepackage{parskip}
\usepackage{indentfirst}
\setlength{\parindent}{15pt}
```

Tableaux

```
a   b
c   d

\begin{tabular}{cccc}
a & b & \\\
c & d & \\
\end{tabular}
```

TABLE 1.1 – Multi-column alignment

Left	Center	Right
A	B	C
D	E	F

```
\begin{table}[ht]
\centering
\caption{Multi-column alignment}
\label{tab:align}
\begin{tabular}{lcr}
Left & Center & Right \\\
\hline
A & B & C \\\
D & E & F \\\
\end{tabular}
\end{table}
```

```
\end{table}
```

Cross-references

```
\hyperref[labelname]{custom text}
```

```
\section{Introduction} \label{sec:intro}  
As seen in Section~\ref{sec:intro}, ...
```

```
\begin{equation} \label{eq:newton}  
F = ma  
\end{equation}  
See Equation~\eqref{eq:newton}.
```

```
\begin{figure}  
\includegraphics{image.png}  
\caption{Sample Image}  
\label{fig:sample}  
\end{figure}  
Refer to Figure~\ref{fig:sample}.
```

```
\begin{table}  
\caption{Sample Data}  
\label{tab:data}  
\end{table}  
Refer to Table~\ref{tab:data}.
```

```
\begin{theorem} \label{thm:main}  
This is a theorem.  
\end{theorem}  
Theorem~\ref{thm:main}
```

```
See page~\pageref{fig:sample}. % Can be any
```

```
\begin{enumerate}  
\item First item \label{item:first}  
\end{enumerate}  
See item~\ref{item:first}.
```

Note : The ~ are non-breaking spaces. This allows for L^AT_EX to never break to a newline.

Number and label equations

$$\mathcal{W}_{KR}(\mathfrak{S}^R, \mathfrak{S}_N^R) \leq \sqrt{\frac{2}{\pi}} Re^{-c^2} \quad (1.1)$$

The equation 1.1

The equation (1.1)

```
\usepackage{hyperref}

\begin{equation}\label{eq:main-result-ginibre}
\mathcal{W}_{\{KR\}}(\mathfrak{S}^R, \mathfrak{S}^R_N) \leqslant \sqrt{\frac{2}{\pi}} R e^{-c^2}
\end{equation}
```

The equation~\ref{eq:main-result-ginibre}

The equation~\eqref{eq:main-result-ginibre}

Just import hyperref to get

Align equations

$$x = y$$

$$y \leqslant z$$

```
\begin{align*}
x &= y \\
y &\leqslant z
\end{align*}
```

Use the unstarred version `\begin{align}` to number the equation.

`align` is used without math equations. It's a substitute (or another version) for math equations.

`aligned` is a version to be used inside math equations.

$$\forall n \in \mathbf{N}, \begin{cases} a_{n+1} \in (b_n, 1) \\ b_{n+1} = \sqrt{\frac{a_{n+1}^2 + u_n(1 - a_{n+1}^2)}{a_{n+1}^2 + (1 + u_n)(1 - a_{n+1}^2)}} \end{cases}$$

```
\[
\forall n \in \mathbf{N},
\left\{
\begin{aligned}
&a_{n+1} \in (b_n, 1) \\
&b_{n+1} = \sqrt{\frac{a_{n+1}^2 + u_n(1 - a_{n+1}^2)}{a_{n+1}^2 + (1 + u_n)(1 - a_{n+1}^2)}}
\end{aligned}
\right.
\]
```

Multiline equations

```
\begin{multline*}
```

```

    long loooooong equation
\end{multline*}

```

No math mode or equation needed.

Use starred version if you don't want it to be numbered.

Remove the star if you want it to be numbered.

Another precision :

```

\begin{unnumberedenvironment*}
\end{unnumberedenvironment*}
// Star at the END

```

```

\begin*{section}
\end*{section}

```

```

\begin*{subsection}
\end*{subsection}
// Star in the MIDDLE

```

Bibliography

In a .bib file :

```

@book{PPIntro2003,
  author={D. J. Daley and D. Vere-Jones},
  title={An Introduction to the Theory of Point Processes},
  journal={Probability and Its Applications},
  year={2003},
  volume={1},
  edition={2},
  doi={https://doi.org/10.1007/b97277},
  publisher={Springer},
  isbn={978-0-387-95541-4},
  isbn_softcover={978-1-4757-8109-0},
  isbn_ebook={978-0-387-21564-8},
}

```

```

@incollection{Decreusefond2016,
  title={Determinantal point processes},
  author={Decreusefond, Laurent, ...},
  booktitle={Stochastic analysis, ...},
  pages={311--342},
  year={2016},
  publisher={Springer}
}

```

```

@misc{ParisEst2022,
  author = {Nathael Gozlan, ...},
  title = {Notes de cours sur le Transport Optimal},
  year = {2022},
}

@misc{MorozSoftware,
  author      = {G. Moroz},
  title       = {Determinantal point process},
  year        = {2020},
  howpublished = {\url{...}},
  note        = {Software, doi:10.5281/zenodo.4088585 },
}

And then,

\usepackage{cite}

\cite{ParisEst2022}

...

\bibliographystyle{plain}
\bibliography{Article, books, misc} % Files *.bib

$ > pdflatex main.tex ; bibtex main ; pdflatex main.tex ; pdflatex main.tex

Use bibtool -s -i misc.bib -o misc.bib -r 'author,year,title' to sort and reformat your
*.bib files!

Bibliography styles :
— plain : Entries are listed in alphabetical order by author and are labeled numerically.
— unsrt : Similar to plain, but entries are listed in the order they are cited in the document.
— alpha : Entries are listed alphabetically and are labeled with an alphabetic code based on
the author's name and the year of publication.
— abbrv : Similar to plain, but uses abbreviated journal names and first names of authors.

```

Minipages

This is a block of text that takes 90% of the page text width block.

```

\begin{minipage}{0.9\textwidth}
  This is a block of text that takes 90\% of the page text width block.
\end{minipage}

\setlength{\fboxsep}{5pt}
\setlength{\fboxrule}{1pt}
\fbox{
  \begin{minipage}{\dimexpr\textwidth-2\fboxsep-2\fboxrule}

```

```

    This text fits perfectly inside a box that is the full width of the text area.
    \end{minipage}
}

```

Note : `\dimexpr -2\fbboxsep-2\fbboxrule` computes the width of the minipage.

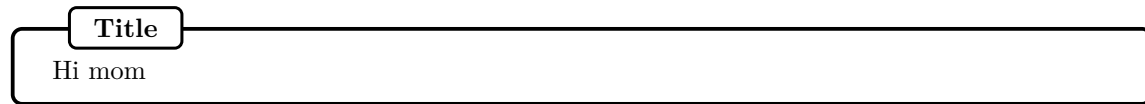
`\dimexpr a - b + c` allows to perform computations (in particular provides the syntax for it)

`\textbackslash -2\fbboxsep-2 \fbboxrule` Computes the text block width, minus twice the fbox padding, minus twice the fbox line width.

`\parbox` and `\makebox`

`\noindent` allows to remove indentation if needed

More fancy boxes



```
\usepackage[most]{tcolorbox}
```

```

\newtcolorbox{mybox}[1][]{
    enhanced,
    attach boxed title to top left={yshift=-3mm, yshifttext=-1mm, xshift=0.05\textwidth},
    colback=white,           % default background (white for most document classes)
    colframe=black,          % black frame
    colbacktitle=white,      % white background for title area
    coltitle=black,          % black text in title
    fonttitle=\bfseries,     % bold title font
    title=#1
}

```

```

\begin{mybox}[Title]
    Hi mom
\end{mybox}

```

Note : Do not put two carriage return between two arguments (it becomes interpreted as a paragraph end and doesn't work anymore)

New environment

```
\newenvironment{name}[number of arguments][default value]{begin definition}{end definition}
```

Sections numbering

Chapter.Section.Subsection.Subsubsection numbering :


```

\texttt{\renewcommand\thesubsubsection{\thesubsection.\alph{subsubsection}}
% ^ 2.1.4.a)
\setcounter{secnumdepth}{3}
% ^ Required in the book documentclass, subsubsections are
% unnumbered by default in book documentclass

```

Subsubsection numbering :

```

\texttt{\renewcommand\thesubsubsection{\alph{subsubsection}}
% ^ a)
\setcounter{secnumdepth}{3}
% ^ Required in the book documentclass, subsubsections are
% unnumbered by default in book documentclass

```

Table of contents

`\tableofcontents`, place in document wherever you want you table of contents to be (at the beginning, at the end, before/after introduction...)

Table of contents numbering depth

```

\setcounter{tocdepth}{0}
% ^ In book documentclass : show Parts, chapters
\setcounter{tocdepth}{1}
% ^ In book documentclass : show Parts, chapters, sections
\setcounter{tocdepth}{2}
% ^ In book documentclass : show Parts, chapters, sections, subsections
\setcounter{tocdepth}{3}
% ^ In book documentclass : show Parts, chapters, sections, subsections, subsubsections

```

Packages

Espacements

```

\usepackage{parskip}
\includegraphics[scale=0.5]{img.jpg}

```

Unités pour la longueur

```

pt (72.25 pt = 1 in)
in (1 in = 2.54 cm)
cm (cm)
mm (mm)

```

graphicx

```
\usepackage{graphicx}
\includegraphics[scale=0.5]{img.jpg}
```

Fancy headers

```
\renewcommand{\chaptermark}[1]{
  \markboth{\chaptername\ \thechapter.\ #1}{}
} % This actually sets \leftmark
\renewcommand{\sectionmark}[1]{
  \markright{\thesection.\ #1}
} % This sets \rightmark
\pagestyle{fancy}
\fancyhead[LE,R0]{\nouppercase{\rightmark}} % O : for odd pages
\fancyhead[LO,RE]{\nouppercase{\leftmark}} % E : for even pages
```

Note : If `\documentclass[oneside]{book}` is set, then the E and O are useless (because there's only one side)

Note : Make sure to deal with `fancyhdr` **AFTER** setting the geometry settings!

Otherwise, some things such as `\setlength{\headheight}{15pt}` don't work.

Algorithms

```
\begin{algorithm}
  \caption{This algorithm does ...}
  \begin{algorithmic}[1]
    \State \textbf{Input :} ...
    \State \textbf{Output :} ...
    \State  $x \leftarrow ...$ 
    \State ...
    \For{$i \leftarrow 2$ to  $n$ }
      \State ...
    \EndFor
  \end{algorithmic}
\end{algorithm}
```

`\begin{algorithmic}[1]` Sets line numbering.

`\begin{algorithmic}[2]` Would set line numbering, but numbering every two line.

`\begin{algorithmic}` Disables line numbering.

Preamble for the article

```
\documentclass[11pt]{article}
%
\usepackage[utf8]{inputenc}
\usepackage[T1]{fontenc}
\usepackage{lmodern}
\usepackage[english]{babel}
\newcommand{\og}{\langle}
\newcommand{\fg}{\rangle}
%
\usepackage{amsmath}
\usepackage{amssymb}
\usepackage{amsfonts}
\usepackage{amsthm}
%
\usepackage{svg}
\usepackage{graphicx}
\usepackage{tikz}
%
\usepackage{cite}
\usepackage{hyperref}
\usepackage{geometry}
%
\setlength{\parindent}{15pt} % or any desired value
\setlength{\parskip}{6pt} % optional:
\newgeometry{left = 1in, right = 1in, top = 1in}
%
\usepackage{algorithm}
\usepackage{algpseudocode} % For algorithmic environment
%
\theoremstyle{definition}
\newtheorem{definition}{Definition}
\newtheorem{theorem}[definition]{Theorem}
\newtheorem{corollary}[definition]{Corollary}
\newtheorem{notation}[definition]{Notation}
\newtheorem{proposition}[definition]{Proposition}
\newtheorem{remark}[definition]{Remark}
\newtheorem{hypothesis}[definition]{Hypothesis}
%
\hypersetup{
    colorlinks,
    citecolor=black,
    filecolor=black,
    linkcolor=black,
    urlcolor=black
}
```

```
%  
\title{...}  
\author{...}  
\date{...}  
%  
\begin{document}  
%  
\maketitle  
%  
\begin{abstract}  
...  
\end{abstract}  
%  
\tableofcontents  
%  
\section{Introduction}  
...
```

TikZ

Figures



FIGURE 1.1 – Two TikZ figures side by side

```
\usepackage{subcaption}

\begin{figure}[h]
  \centering
  \begin{subfigure}[b]{0.45\textwidth}
    \centering
    \begin{tikzpicture}
      \node[circle, draw] at (0,0){};
    \end{tikzpicture}
    \caption{First figure}
  \end{subfigure}
  \hfill
  \begin{subfigure}[b]{0.45\textwidth}
    \centering
    \begin{tikzpicture}
      \node[circle, draw] at (2,0){};
    \end{tikzpicture}
    \caption{Second figure}
  \end{subfigure}
  \caption{Two TikZ figures side by side}
\end{figure}
```



Two TikZ figures side by side

```

\usepackage{subcaption}

\begin{figure}[h]
  \centering
  \captionsetup{labelformat=empty}
  \begin{subfigure}[b]{0.45\textwidth}
    \centering
    \captionsetup{labelformat=empty}
    \begin{tikzpicture}
      \node[circle, draw] at (0,0){};
    \end{tikzpicture}
    \caption{First figure}
  \end{subfigure}
  \hfill
  \begin{subfigure}[b]{0.45\textwidth}
    \centering
    \captionsetup{labelformat=empty}
    \begin{tikzpicture}
      \node[circle, draw] at (2,0){};
    \end{tikzpicture}
    \caption{Second figure}
  \end{subfigure}
  \caption{Two TikZ figures side by side}
\end{figure}

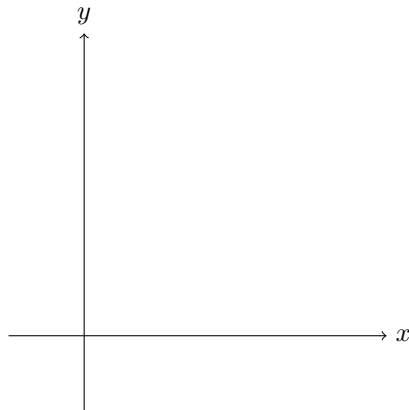
```

Use

```
\caption*{\textbf{Figure:} A simple diagram.}
```

to remove the entry from the list of figures.

Axis



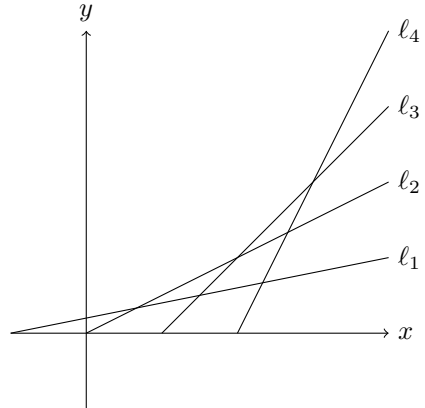
```

\begin{center}
\begin{tikzpicture}[x=1cm,y=1cm]

\draw[>-] (-1,0) -- (4,0) node[right] {$x$};
\draw[>-] (0,-1) -- (0,4) node[above] {$y$};

\end{tikzpicture}
\end{center}

```



```

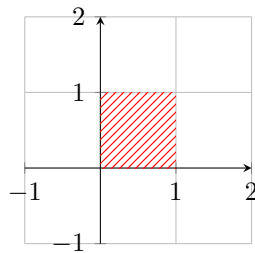
\begin{center}
\begin{tikzpicture}[x=1cm,y=1cm]

\draw[>-] (-1,0) -- (4,0) node[right] {$x$};
\draw[>-] (0,-1) -- (0,4) node[above] {$y$};

\draw (-1,0) -- (4,1) node[anchor=west]{$\ell_1$};
\draw (0,0) -- (4,2) node[anchor=west]{$\ell_2$};
\draw (1,0) -- (4,3) node[anchor=west]{$\ell_3$};
\draw (2,0) -- (4,4) node[anchor=west]{$\ell_4$};

\end{tikzpicture}
\end{center}

```



```

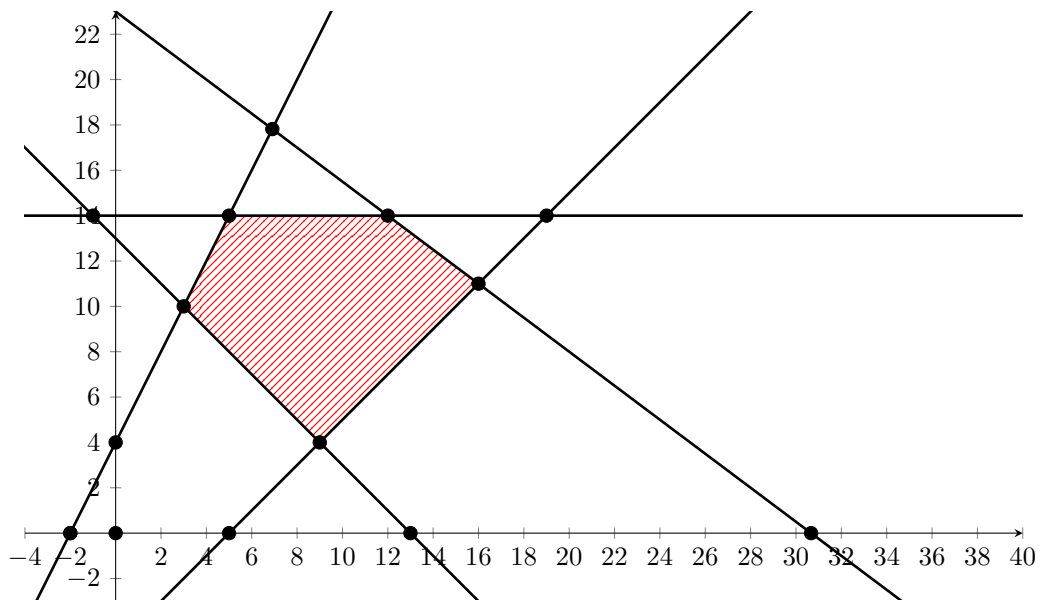
\begin{center}
\begin{tikzpicture}
\begin{axis}[

```

```

x=1.0cm,y=1.0cm,
axis lines=middle,
xmajorgrids=true,
ymajorgrids=true,
xmin=-1.0,
xmax=2.0,
ymin=-1.0,
ymax=2.0,
xtick={-1.0,0.0,...,2.0},
ytick={-1.0,0.0,...,2.0},
]
\clip(-1.0,-1.0) rectangle (2.0,2.0);
\fill[line width=4.pt,color=red,fill=red,pattern=north east lines,pattern color=red] (0.,0.) -
\end{axis}
\end{tikzpicture}
\end{center}

```



```

\begin{center}
\begin{tikzpicture}
\begin{axis}[
x=0.3cm,y=0.3cm,
axis lines=middle,
xmin=-4.0,
xmax=40.0,
ymin=-3.0,
ymax=23.0,
xtick={-4.0,-2.0,...,40.0},

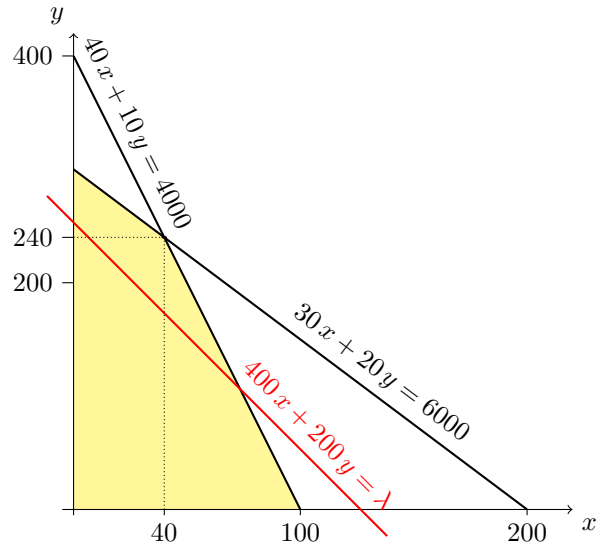
```



```

ytick={-2.0,0.0,...,22.0},
]
\clip(-4.,-3.) rectangle (40.,23.);
\fill[
  line width=8.pt,
  color=red,
  fill=red,
  pattern=north east lines,
  pattern color=red
] (3.,10.) -- (5.,14.) -- (12.,14.) -- (16.,11.) -- (9.,4.) -- cycle;
\draw [line width=1.pt,domain=-12.:40.] plot(\x,{(-13.-1.*\x)/1.});
\draw [line width=1.pt,domain=-12.:40.] plot(\x,{(-5.-1.*\x)/-1.});
\draw [line width=1.pt,domain=-12.:40.] plot(\x,{(-4.--2.*\x)/1.});
\draw [line width=1.pt,domain=-12.:40.] plot(\x,{(-92.-3.*\x)/4.});
\draw [line width=1.pt,domain=-12.:40.] plot(\x,{(-14.-0.*\x)/1.});
\begin{scriptsize}
  \draw [fill=black] (-1.,14.) circle (2.5pt);
  \draw [fill=black] (3.,10.) circle (2.5pt);
  \draw [fill=black] (5.,14.) circle (2.5pt);
  \draw [fill=black] (6.909090909090909,17.818181818181817) circle (2.5pt);
  \draw [fill=black] (12.,14.) circle (2.5pt);
  \draw [fill=black] (19.,14.) circle (2.5pt);
  \draw [fill=black] (16.,11.) circle (2.5pt);
  \draw [fill=black] (9.,4.) circle (2.5pt);
  \draw [fill=black] (-2.,0.) circle (2.5pt);
  \draw [fill=black] (-2.,0.) circle (2.5pt);
  \draw [fill=black] (0.,0.) circle (2.5pt);
  \draw [fill=black] (0.,4.) circle (2.5pt);
  \draw [fill=black] (5.,0.) circle (2.5pt);
  \draw [fill=black] (13.,0.) circle (2.5pt);
  \draw [fill=black] (30.666666666666668,0.) circle (2.5pt);
\end{scriptsize}
\end{axis}
\end{tikzpicture}
\end{center}

```



```

\begin{tikzpicture}[x=0.03cm,y=0.015cm]

  \fill[yellow!50] (0,0) -- (100,0) -- (40,240) -- (0,300) -- cycle;

  % Axes
  \draw[->] (-5,0) -- (220,0) node[below right] {$x$};
  \draw[->] (0,-5) -- (0,420) node[above left] {$y$};

  \foreach \x/\lab in {40/40,100/100,200/200}{
    \draw (\x,0) -- (\x,-5) node[below] {\lab};
  }

  \foreach \y/\lab in {200/200,240/240,400/400}{
    \draw (0,\y) -- (-5,\y) node[left] {\lab};
  }

  \draw[thick] (0,400) -- (100,0)
    node[pos=0.42,above left,sloped] {$40x + 10y = 4000$};

  \draw[thick] (0,300) -- (200,0)
    node[pos=0.65,above,sloped] {$30x + 20y = 6000$};

  \draw[thick,red,yshift=-10,xshift=-10] (0,300) -- (150,0)
    node[pos=0.75,above,sloped] {$400x + 200y = \lambda$};

  \fill (40,240) circle [radius=1.2];
  \draw[densely dotted] (40,0) -- (40,240);
  \draw[densely dotted] (0,240) -- (40,240);

```

`\end{tikzpicture}`