
Practical Work 5: Advanced Document Structure

Author: Your Name

Date: \today.

Lesson

Write the following commands in $\text{\LaTeX}$, then explain each line:

```
\documentclass[a4paper,11pt]{article}
\usepackage[utf8]{inputenc}
\usepackage{amsmath, amssymb, geometry}
\geometry{a4paper, top=2cm, bottom=2cm, left=3cm, right=3cm}
\begin{document}

  \title{Advanced Document Structure}
  \author{Your Name}
  \date{\today}
  \maketitle
  \tableofcontents

  \section{Introduction}
  ...
  ...
\end{document}
```

See what the difference is between:

```
\begin{equation}
  x+y=2025.
\end{equation}
```

and

```
\begin{equation*}
  x+y=2025.
\end{equation*}
```

Also, $\$x+y=2025\$$. **and** $\$x+y=2025\$$.

Finally,

a_1 , a_{11} , $a_{\{11\}}$.

Try to write:

```
\begin{equation*}
\begin{bmatrix}
a & b \\
c & d
\end{bmatrix}
\end{equation*}
```

Also:

```
\begin{equation*}
\left[
\begin{array}{cc}
a & b \\
c & d
\end{array}
\right]
\end{equation*}
```

Finally,

```
\begin{equation*}
\begin{cases}
2x+3y=5, \\
4x-y=3.
\end{cases}
\end{equation*}
```

and

```
\begin{equation*}
\left\{
\begin{array}{l}
2x+3y=5, \\
4x-y=3.
\end{array}
\right.
\end{equation*}
```

Now, we will learn how to name an equation and then call it using the command `\label{key}`

Write the following:

```
\begin{equation}
```

```
(x-1)(x-2) = 0.
```

```
\label{eq}
```

```
\end{equation}
```

Equation (\ref{eq}) admits two solutions: $(x_1; x_2) = (1; 2)$.

PW On Matrix

This document builds on the previous lesson and introduces more advanced features of $\text{\LaTeX}$, including matrices and systems of equations.

1. Text Formatting

Here are some examples of text formatting:

Bold text, *Italic text*, Underlined text, and Monospaced text.

2. Mathematical Equations

Here are some examples of mathematical equations:

2.1 Linear Algebra

A system of linear equations can be written in matrix form:

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$$

2.2 System of Equations

Solve the following system of equations:

$$\begin{cases} 2x + 3y = 5 \\ 4x - y = 3 \end{cases} \quad (1)$$

This can be written in matrix form as:

$$\begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 3 \end{bmatrix}$$

The solution is:

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix}^{-1} \begin{bmatrix} 5 \\ 3 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

Then, the solution of (1) is given by $(x; y) = (1; 1)$.

3. Displaying L^AT_EX Code

Here is the L^AT_EX code used in this document.

```
\documentclass[a4paper,10pt]{article}
\usepackage[utf8]{inputenc}
\usepackage{amsmath, amssymb}
\usepackage{geometry}
\geometry{a4paper, top=2cm, bottom=2cm, left=3cm, right=3cm}

\begin{document}

\title{Advanced Document Structure}
\author{Your Name}
\date{\today}
\maketitle
\tableofcontents

\section{Introduction}

This document builds on the previous lesson and introduces more advanced
features of \LaTeX, including matrices and systems of equations.

\section{Text Formatting}

Here are some examples of text formatting:

\textbf{Bold text}, \textit{Italic text}, \underline{Underlined text}, and
\texttt{Monospaced text}.

\section{Mathematical Equations}

Here are some examples of mathematical equations:

\subsection{Linear Algebra}

A system of linear equations can be written in matrix form:
\begin{equation*}
\left[
\begin{array}{ccc}
a_{11} & a_{12} & a_{13} \\
\end{array}
\right]
```

```

a_{21} & a_{22} & a_{23} \\
a_{31} & a_{32} & a_{33}%
\end{array}
\right]
\begin{bmatrix}
x_{1} \\
x_{2} \\
x_{3}%
\end{bmatrix}%
=
\begin{bmatrix}
b_{1} \\
b_{2} \\
b_{3}%
\end{bmatrix}%
\end{equation*}

\subsection{System of Equations}

Solve the following system of equations:%
\begin{equation}
\begin{cases}
2x+3y=5 \\
4x-y=3
\end{cases}
\label{eq1}
\end{equation}%
This can be written in matrix form as:
\begin{equation*}
\begin{bmatrix}
2 & 3 \\
4 & -1
\end{bmatrix}%
\begin{bmatrix}
x \\
y
\end{bmatrix}%
=
\begin{bmatrix}
5 \\
3
\end{bmatrix}

```

```

\end{bmatrix}%
\end{equation*}%
The solution is:
\begin{equation*}
\begin{bmatrix}
x \\
y
\end{bmatrix}%
=
\begin{bmatrix}
2 & 3 \\
4 & -1
\end{bmatrix}%
^{-1}%
\begin{bmatrix}
5 \\
3
\end{bmatrix}%
=
\begin{bmatrix}
1 \\
1
\end{bmatrix}%
\end{equation*}%
Then, the solution of (\ref{eq1}) is given by  $\left( \begin{matrix} x \\ y \end{matrix} \right) = \left( \begin{matrix} 1 \\ 1 \end{matrix} \right)$ .
\end{document}

```