SSL Latex Assignment

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1 Introduction

This document serves as a comprehensive guide to various mathematical and technical concepts, presented in a structured and easy-to-follow format.

Section 2: Mathematics explores fundamental mathematical concepts, beginning with trigonometric equations and identities, and moving through topics such as matrices, radicals, integration, summation, differentiation, and the use of nested brackets. This section aims to reinforce key principles and provide useful equations and formulas for each area.

Section 3: Tables and Figures demonstrates how to include tables and figures in a LaTeX document, showcasing ways to organize data and visualize information effectively.

Section 4: Numbering explains various types of lists and numbering conventions, including unordered (bullet) lists, ordered (numbered) lists, Roman numerals, alphabetic lists, and nested lists. The section provides examples to help readers apply these styles in their own documents.

Section 5: Pseudocode introduces techniques for writing pseudocode in LaTeX, allowing readers to structure algorithms and complex procedures in a clear,readable format.

Section 6: Coloring covers the use of color in LaTeX, showing how to apply different colors to text, backgrounds, and other elements to enhance readability and aesthetic appeal.

Section 7: Citing the Papers explains the methods for citing academic papers and references in LaTeX, which is essential for creating well-documented technical or research papers.

This document includes both a list of figures and a list of tables, helping the reader quickly locate visual elements. Each section is carefully structured to ensure clarity and utility, making this guide a valuable resource for anyone seeking to enhance their skills in LaTeX and mathematical documentation.

2 Mathematics

2.1 Writing Trigonometric Equations

There are six trigonometric functions:

- $\sin x$
- $\cos x$
- $\tan x$
- $\cot x$
- $\sec x$
- $\csc x$

2.1.1 Some trigonometric identities

- $\sin^2 x + \cos^2 x = 1$
- $\sin^2 \theta + \cos^2 \theta = 1$
- $1 + \tan^2 x = \sec^2 x$
- $1 + \cot^2 x = \csc^2 x$
- $\tan(2x) = \frac{2 \tan x}{1 - \tan^2 x}$

2.2 Matrices

- Row Vector: A $1 \times N$ matrix:
  $\begin{bmatrix} a & b & c \end{bmatrix}$
- Column Vector: A $N \times 1$ matrix:
  $\begin{bmatrix} a \\ b \\ c \end{bmatrix}$
- Square Matrix: $N \times N$ matrix:
  $\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}$

2.3 Radicals

- Basic Square Roots:
  $\sqrt{a}$
- Square Root with Expression Inside:
  $\sqrt{x^2 + y^2}$
- Cube Root:
  $\sqrt[3]{a}$
- nth Root:
  $\sqrt[n]{a}$

2.4 Integration

The integral of $f(x) = x^2$ from 0 to 1:

$$\int_0^1 x^2 \, dx = \frac{1}{3}x^3 \Big|_0^1 = \frac{1}{3}$$

2.5 Summation

The sum of the first n natural numbers:

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

2.6 Differentiation

The derivative of $f(x) = x^3$ with respect to x:

$$\frac{d}{dx}x^3 = 3x^2$$

2.7 Nested Brackets

Example 1:

$$w = \left(\sqrt{\left(1 + \frac{1}{x^2}\right)} \cdot \left[\log\left(2 + \frac{1}{y}\right) + \left\{3^x - \left(\frac{2}{z}\right)^y\right\}\right]\right)$$

Example 2:

$$z = \left\{\left(\frac{3}{2} + \left[5^2 - \left(4 + \frac{1}{x}\right)^3\right]\right) \times (1 + \sqrt{y})\right\}$$

Figure 1: IIT DHARWAD

3 Tables and Figures

Happy Synonyms

Column 1	Column 2	Column 3
cheerful	delighted	ecstatic
glad	thrilled	jolly
jubilant	merry	upbeat

Table 1: A simple table in LaTeX

4 Numbering

4.0.1 Unordered (Bullet) Lists

- First item
- Second item
- Third item

4.0.2 Ordered (Numbered) Lists

1. First item
2. Second item
3. Third item

4.0.3 Using Roman Numerals:

I. First item
II. Second item
III. Third item

4.0.4 Using Letters

a) First item
b) Second item
c) Third item

4.0.5 Nested Lists

- First item
  - Nested item 1
  - Nested item 2
- Second item

5 Pseudocode

Pseudocode is an informal way of programming description that does not require any strict programming language syntax or underlying technology considerations. It is used for creating an outline or a rough draft of a program. Pseudocode summarizes a program's flow, but excludes underlying details. LaTeX has several packages for typesetting algorithms in the form of "pseudocode". They provide stylistic enhancements over a uniform style (i.e., all in typewriter font).

Algorithm 1 Merge Sort

```
1: procedure MergeSort(A, left, right)
2:     if left < right then
3:         mid ← floor((left + right)/2)
4:         MergeSort(A, left, mid)
5:         MergeSort(A, mid + 1, right)
6:         Merge(A, left, mid, right)
7:     end if
8: end procedure
9: procedure Merge(A, left, mid, right)
10:    n1 ← mid − left + 1
11:    n2 ← right − mid
12:    Create arrays L[1 . . . n1] and R[1 . . . n2]
13:    for i = 1 to n1 do
14:        L[i] ← A[left + i − 1]
15:    end for
16:    for j = 1 to n2 do
17:        R[j] ← A[mid + j]
18:    end for
19:    i, j, k ← 1, 1, left
20:    while i ≤ n1 and j ≤ n2 do
21:        if L[i] ≤ R[j] then
22:            A[k] ← L[i]
23:            i ← i + 1
24:        else
25:            A[k] ← R[j]
26:            j ← j + 1
27:        end if
28:        k ← k + 1
29:    end while
30:    while i ≤ n1 do
31:        A[k] ← L[i]
32:        i ← i + 1
33:        k ← k + 1
34:    end while
35:    while j ≤ n2 do
36:        A[k] ← R[j]
37:        j ← j + 1
38:        k ← k + 1
39:    end while
40: end procedure
```

6 Coloring

This is blue text.
This is red text.
This text has a yellow background.
This entire paragraph is purple. All sentences here will appear in purple.

7 Citing the Papers

- Investigating the impact of network topology on the processing times of SDN controllers [1]
- SDN controllers: A comparative study [2]
- Controllers in SDN: A Review Report [3]
- Software defined networks: Comparative analysis of topologies with ONOS [4]

References

[1] C. Metter, S. Gebert, S. Lange, T. Zinner, P. Tran-Gia, and M. Jarschel, "Investigating the impact of network topology on the processing times of sdn controllers," in *2015 IFIP/IEEE International Symposium on Integrated Network Management (IM)*, pp. 1214–1219, 2015.

[2] O. Salman, I. H. Elhajj, A. Kayssi, and A. Chehab, "Sdn controllers: A comparative study," in *2016 18th Mediterranean Electrotechnical Conference (MELECON)*, pp. 1–6, 2016.

[3] M. Paliwal, D. Shrimankar, and O. Tembhurne, "Controllers in sdn: A review report," *IEEE Access*, vol. 6, pp. 36256–36270, 2018.

[4] A. Rajaratnam, R. Kadikar, S. Prince, and M. Valarmathi, "Software defined networks: Comparative analysis of topologies with onos," in *2017 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET)*, pp. 1377–1381, 2017.

References

[1] Author A, Author B, "Title of the paper," in *Conference Name*, pp. 1–10, Year.

[2] Author C, Author D, "Another paper title," in *Another Conference*, pp. 20–30, Year.

$$\sin^2 \Theta + \csc^2 \theta = 1$$

$$\left\{ \left(\frac{3}{2} + \left[5^2 - \left(4 + \frac{1}{x} \right)^3 \right) \times (1 + \sqrt{y}) \right\}$$

$$\forall x \, (x > 5)$$