Writing Scientific Documents Using LaTeX

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SMIT SIKKIM MANIPAL UNIVERSITY
SIKKIM MANIPAL INSTITUTE OF TECHNOLOGY

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Why LaTeX?

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- LaTeX allows you to make more consistent, and more easily changeable, documents.

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Math Mode

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$\phi \in \Psi$	`$\phi \in \Psi$`

It is now your turn.

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- Practice 1: $A = \{(x, y, z) \in \mathbb{R}^3 \mid 2x + 3y - z = 1\}$

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- Practice 2: $f(x) = x^2 + 2x + c$

It is now your turn.

- Practice 3: $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = x^2 \cos x$

It is now your turn.

- Practice 4: $\frac{x}{x+1} + \frac{x+2}{x} = \frac{x-1}{x+3}$

Step Functions

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- $$f(x) = \begin{cases} x^2 + 8, & \text{if } 0 \leq x \leq 2 \\ 14, & \text{if } 2 \leq x \leq 4 \\ x^2 - 2, & \text{if } x \geq 4 \end{cases}$$

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- Practice 5: $f(x) = \begin{cases} Red, & \text{if } x \in [a, b] \\ Green, & \text{if } x \in [b, c] \\ Black, & \text{otherwise} \end{cases}$

Step Functions

- Practice 5: $f(x) = \begin{cases} Red, & \text{if } x \in [a, b] \\ Green, & \text{if } x \in [b, c] \\ Black, & \text{otherwise} \end{cases}$
- Practice 6: $f(x) = \begin{cases} \text{Red}, & \text{if } x \in [a, b] \\ \text{Green}, & \text{if } x \in [b, c] \\ \text{Black}, & \text{otherwise} \end{cases}$

Matrices

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

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- ```
  $\begin{pmatrix}
  1800196 29.35 30 60.00 D a& b& c\\
  x& y& z\\
  p& q& r
  \end{pmatrix}$
  ```
  ```

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- Practice 7: $A = \begin{bmatrix} is & have & come & ? \\ ? & had & came & went \end{bmatrix}$

It is now your turn.

- Practice 8: $A =$

is	have	come
was	had	came

It is now your turn.

- Practice 9: $A = \begin{pmatrix} 1 & 1 & 1 & \cdots & 1 \\ 1 & 1 & 1 & \cdots & 1 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 1 & 1 & 1 & \cdots & 1 \end{pmatrix}$

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LaTeX allows you to typeset any sort of equations.

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$$\sum_{n=0}^{\infty}\sum_{k=1}^{n}(n+1)(n^2+1)$$

Using math mode

Inline math mode: `$ . . . $` Evaluate

$$\oint_C \frac{z+3}{z^2+3z+2}dz$$

where C is the contour $|z-2|=1$.

Your turn again

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- Practice 10: $\int_0^1 (\frac{e^x}{e^x+1} + \cos x)dx$

Your turn again

- Practice 10: $\int_0^1 (\frac{e^x}{e^x+1} + \cos x)dx$
- Practice 11: $\int_0^1 \left(\frac{e^x}{e^x+1} + \cos x\right)dx$

Your turn again

- Practice 12: $\left[2 \times \left\{\left(\frac{2}{3} - 2\right) - 3\right\} - 3\right]$

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Writting Equations

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LaTeX allows you to label equations.

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LaTeX assigns numbers to equations.

The mass-energy equivalence is described by the famous equation

$$E = mc^2$$

discovered in 1905 by Albert Einstein. In natural units ($c = 1$), the formula expresses the identity

$$E = m \tag{1}$$

Managing A System of Equations

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$$b = 2a + c \tag{3}$$
$$b = 2c + 1 \tag{4}$$

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```
\begin{eqnarray}
a&=&b+c+2\\
b&=&2a+c\\
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LaTeX assigns numbers to equations.

Solve the system of equations:

$$r^2 = s^2 + t^2, \tag{5}$$

$$2u + 1 = v + w^{\alpha}, \tag{6}$$

$$x = \frac{y + z}{\sqrt{s + 2u}}; \tag{7}$$

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Is there any triplet (r, s, t) of integers satisfying the equation (5).

Practice Once Again

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Practice 13:

LaTeX and equations.

Solve the system of equations:

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = xy, \tag{8}$$

$$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial x}, \tag{9}$$

subject to the conditions $u(x, 0) = u(y, 0) = 2$.

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- I love working in LaTeX so much that I stop peeping through the **Windows.**
- So it is very difficult for me to mention disadvantages, but I am sure **they (?)** can tell you hundreds.

Getting Help and Learning More

- LaTeX Wikibooks:
  en.wikibooks.org/wiki/LaTeX
- *The Not So Short Introduction to LaTeX 2ε*:
  www.ctan.org/tex-archive/info/lshort/english/lshort.
- *A Short Math Guide for LaTeX*:
  ftp://ftp.ams.org/pub/tex/doc/amsmath/short-math-gui
- *The Beamer Theme Matrix*:
  www.hartwork.org/beamer-theme-matrix/

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blue **And your best friend Google!**

$ Thank You $