## ISLAMIAH COLLEGE (AUTONOMOUS)



LAB MANUAL

## MATHEMATICAL SOFTWARE

## P8MSNM41

For the Candidates admitted from the academic year 2018-2019

By

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## P8MSNM41 MATHEMATICAL SOFTWARE

## CREATING A DOCUMENT USING LATEX

- Title creation
- Page Layout
- Formatting
- Fonts
- List Structures
- Tables
- Bibliography Management.


## MATLAB BASICS

- Algebra and Arithmetic
- Calculus, Graphics and Linear Algebra
- MATLAB Programming

1. Prepare a latex code which will output a certificate as shown below.

## Islamiah College (Autonomous) Vaniyambadi

October 15, 2015

## Certificate

This is certify that Mr. $\qquad$ has undergone a course at this college. He has secured $\qquad$ $\%$ marksand is qualified. His proficiency in LATEXis $\qquad$ .

Latex Command

Output
2. Prepare a Latex code for the below.

The Fourier Series for the function $f(x)$ in the interval $c<x<$ $c+2 \pi$ is given by

$$
f(x)=\frac{a_{0}}{2}+\sum_{n=1}^{\infty} a_{n} \cos n x+\sum_{n=1}^{\infty} b_{n} \sin n x
$$

where

$$
\begin{gathered}
a_{0}=\frac{1}{\pi} \int_{c}^{c+2 \pi} f(x) d x \\
a_{n}=\frac{1}{\pi} \int_{c}^{c+2 \pi} f(x) \cos n x d x \\
a_{0}=\frac{1}{\pi} \int_{c}^{c+2 \pi} f(x) \sin n x d x
\end{gathered}
$$

These values of $a_{0}, a_{n}, b_{n}$ are known as "Euler's Formulae". Latex Command

Output
3. Prepare a Latex code for the following

Find a unit tangent vector normal to the surface $x y^{3} z^{2}=4$ at the point ( $-1,-1,2$ ).

Solution:
Given surface $\phi=x y^{3} z^{3}-4$ a vector normal to the given surface is $\nabla \phi$

$$
\begin{aligned}
& \nabla \phi=\overrightarrow{\mathrm{\imath}} \frac{\partial \phi}{\partial \mathrm{x}}+\overrightarrow{\mathrm{\jmath}} \frac{\partial \phi}{\partial \mathrm{y}}+\overrightarrow{\mathrm{k}} \frac{\partial \phi}{\partial \mathrm{z}} \\
= & y^{3} z^{2} \overrightarrow{\mathrm{\imath}}+3 x y^{2} z^{2} \overrightarrow{\mathrm{\jmath}}+2 x y^{3} z \overrightarrow{\mathrm{k}}
\end{aligned}
$$

$$
\text { At }(-1,-1,2) \nabla \phi=-4 \vec{\imath}-12 \vec{\jmath}+4 \overrightarrow{\mathrm{k}}
$$

Latex Command

Output
4. Prepare a latex code for the following with a title "Mathematics equations" using title command

## Integral

$$
\begin{align*}
& \int_{S} f(x, y) d(x, y) \\
& =\int_{a}^{b}\left[\int_{\phi_{1}(x)}^{\phi_{2}(x)} f(x, y) d y\right] d x \tag{1}
\end{align*}
$$

## Partial derivative

$$
\begin{equation*}
D_{r, k} f=\frac{\partial^{2} f}{\partial x_{r} \partial x_{k}} \tag{2}
\end{equation*}
$$

Example equation for Integral(1)
Example equation of Partial derivative (2).

Latex Command

Output
5. Prepare a Latex code for the following with a Title "Mathematical Expressions" using title command.
Replace $x$ and $y$ by $\frac{x}{3^{n}}$ and $\frac{y}{3^{n}}$, respectively in(2.3), we have

$$
\mu\left(3^{n} f\left(\frac{3 x+y}{3^{n}}\right)+3^{n} f\left(\frac{x+3 y}{3^{n}}\right)-3^{n} f\left(\frac{4 x}{3^{n}}\right)-3^{n} f\left(\frac{4 y}{3^{n}}\right)\right) \geq \mu^{\prime}\left(\varphi\left(\frac{x}{3^{n}}, \frac{y}{3^{n}}\right), \frac{t}{3^{n}}\right)
$$

and

$$
v\left(3^{n} f\left(\frac{3 x+y}{3^{n}}\right)+3^{n} f\left(\frac{x+3 y}{3^{n}}\right)-3^{n} f\left(\frac{4 x}{3^{n}}\right)-3^{n} f\left(\frac{4 y}{3^{n}}\right)\right) \leq v^{\prime}\left(\varphi\left(\frac{x}{3^{n}}, \frac{y}{3^{n}}\right), \frac{t}{3^{n}}\right)
$$

for all $x, y \in X, t>0$.

## Latex Command

6. Prepare a latex code for the following equations.

$$
\begin{aligned}
& f(x)=f(a)+\frac{f^{\prime}(a)}{1!}(z-a)+\ldots+\frac{f^{n-1}(a)}{(n-1)!}(z-a)^{(n-1)} \\
&+(z-a)^{n} f^{n}(a) . \\
& \sum_{n=0}^{\infty} c_{n} x^{n}=\left(\sum_{n=0}^{\infty} a_{n} x^{n}\right)\left(\sum_{n=0}^{\infty} b_{n} x^{n}\right)
\end{aligned}
$$

Latex Command
7. Prepare a Latex code using Theorem style.

Theorem: 1. If $A_{1}$ and $A_{2}$ are connected subsets of a metric space $M$, and if $A_{1} \cap A_{2} \neq \phi$, then $A_{1} \cup A_{2}$ is also connected. Theorem: 2. If the subset $A$ of the metric space ( $M, \rho$ ) is totally bounded, then $A$ is bounded.

Latex Command

8. Prepare a Latex code to include a Picture using Graphicx Options.

Latex Command

Output
9. Prepare a Latex code for page layout with topmargin 1 inch, odd side margin 1.5 inch, text width 15 cm and Text height 20 cm .

Latex Command

Output
10. Prepare a Latex code for the following using List Ordered lists

1. Too much of anything good for nothing
(a) Slow and study wins the rays
i. Make a while the sun shine raise
A. Experience is the best teacher

Latex Command

Output
11. Prepare a latex code to create a below list

$$
\begin{array}{ll}
\bullet & (f \pm g)^{\prime}(c)=f^{\prime}(c)+g^{\prime}(c) \\
\bullet & (f \cdot g)^{\prime}(c)=f^{\prime}(c) \cdot g^{\prime}(c) \\
\bullet \quad\left(\frac{f}{g}\right)^{\prime}(c)=\frac{g(c) f^{\prime}(c)-f(c) g^{\prime}(c)}{g(c)^{2}}
\end{array}
$$

Latex Command
12. Prepare a latex code using theorem style.

Definition 1 Let $(M, \rho)$ be a metric space and let A be a subset of M. If A has either (and hence both) of the properties:
(a) It is impossible to find non empty subsets $A_{1}, A_{2}$ of M such that $A=A_{1} \cup A_{2}, \overline{A_{1}} \cap A_{2}=\phi, A_{1} \cap \overline{A_{2}}=\phi$.
(b) When $(A, \rho)$ is itself regarded as a metric space, then there is no set except A and $\phi$ which is both open and closed in $(A, \rho)$.

Latex Command

13. Prepare a latex code to create a below table.

| Multirow | Multicolumn |  |  |
| :--- | :--- | :--- | :--- |
|  | Tree | Bus | Car |
|  | Plant | Van | Ship |

## Latex Command

14. Prepare a latex code of below using Bibliography.

In 1940, S. M. Ulam[3] raised the following question. Under what conditions does there exists an additive mapping near an approximately addition mapping? The case of approximately additive functions was solved by D. H. Hyers[1] under certain assumption. In 1978, a generalized version of the theorem of Hyers for approximately linear mapping was given by Th. M. Rassias[2].
[1] D. H. Hyers, On the stability of the linear functional equation, Proc. Natl. Acad. Sci., 27, 222-224(1941)
[2] Th.M. Rassias, On the stability of the linear mapping in Banach spaces,Proc.Amer.Math. Soc., 72, 297-300 (1978).
[3] S.M. Ulam, Problems in Modern Mathematics, Science ed.,„John Wiley Sons: New York;(1940).

Latex Command

## Output

15. Write a Matlab code to find $f_{x}, f_{y}, f_{x x}, f_{x y}, f_{y y}$ if $f(x, y)=$ $\sin \left(x^{2}+2 y\right)$.

Command

## Output

16. Write a Matlab code to find extreme value of functions $f(x)=$ $(x+5)^{2}\left(x^{3}-10\right)$.

Command

## Output

17. Write a Matlab code: Let $f(x)=\frac{2 x+1}{x-2}$ and $g(x)=x^{2}+1$ compute the limit as $x \rightarrow 3$.
Command

Output
18. Write a Matlab code : If $U=\frac{x y}{x+y}$, Show that $x \frac{\partial U}{\partial x}+y \frac{\partial U}{\partial y}=U$ Command

Output
19. Write a Matlab command for $\lim _{x \rightarrow a} \frac{x^{2}-a^{2}}{x-a}$. Command

Output
20. Write a Matlab command to find $\int_{0}^{1} x^{3}+5 x d x$.

Command

## Output

21. Write a Matlab command to evaluate $\int_{0}^{a} \int_{0}^{b}(x+y) d x d y$. Command

Output
22. Write a Matlab command to find $\frac{d y}{d x}$ when $y=x \sin x$.

Command

Output
23. Write a Matlab command to plot $\sin x$ and $\cos x$ curve.

Command

Output
24. Write a Matlab command to find $A-B, B-A, A \cap B$ and $A U B$; where $A=\{1 ; 2 ; 3 ; 4 ; 5\}$ and $B=\{3 ; 5 ; 7 ; 9\}$

Command

Output

