Source Rich Text

tex

pg

```latex
\documentclass{beamer}
\usepackage[utf8]{inputenc}
\usepackage{framed}
\usepackage{xcolor}
\usepackage{graphicx}

\title{{\Huge{\textcolor{green}{ASSIGNMENT 2}}}}

\institute{\Large{\textbf{Mata Sundri College for Women}


\textbf{{University of Delhi}}}}

\author{\LARGE{\textcolor{red}{Sneha Paliwal} \\
\normalfont{College Roll no.} $=$ \textbf{\large{MAT $/$ 20 $/$ 127}} \\
\normalfont{University Roll no.} $=$ \textbf{\large{20044563049}}}}

\date{}

\usetheme{Frankfurt}
\usecolortheme{beetle}

\begin{document}

\begin{frame}
\titlepage{}
\end{frame}

\begin{frame}{EXAMPLE 9.5 : Part 1}
\begin{enumerate}
\item [\cdot]
Let $\mathbf{x}=(x_1,\ldots,x_n)$,
where the $x_i$ are nonnegative real numbers.
Set
\[
M_r(\mathbf{x})=\left(\frac{x_1^r+x_2^r+\cdots+x_n^r}{n}\right)^{1/r},
\; \; r \in \mathbf{R} \setminus \{0\},
\]
and
\[
M_0(\mathbf{x})=\left( x_1 x_2 \ldots x_n \right)^{1/n}.
\]
We call $M_r(\mathbf{x})$ the \emph{$r$th power mean} of $\mathbf{x}$.
```

```latex
Claim :  \lim_{r \rightarrow 0} M_r(\mathbf{x}) = M_0(\mathbf{x}).

\end{enumerate}
\end{frame}

\begin{frame}{Part 2}
\begin{enumerate}
\item [\cdot]
Define
\[
V_n=
\left[
\begin{array}{ccccc}
1 & 1 & 1 & \ldots & 1\\
x_1 & x_2 &x_3 & \ldots & x_n\\
x_1^2 & x_2^2 & x_3^2 & \ldots & x_n^2\\
\vdots & \vdots & \vdots & \ddots & \vdots\\
x_1^{n-1} & x_2^{n-1} & x_3^{n-1} & \ldots & x_n^{n-1}
\end{array}
\right].
\]

We call $V_n$ the \emph{Vandermonde} \emph{matrix} of order $n$.

Claim:
\[
\det V_n = \prod_{1 \leq i < j \leq n}(x_j-x_i).
\]
\end{enumerate}
\end{frame}

\begin{frame}{QUESTION 4}

\begin{framed}
$3^3+4^3+5^3=6^3$
\end{framed}

\begin{framed}
\sqrt{100}=10
\end{framed}

\begin{framed}
$ (a+b)^3=a^3+3a^2b+3ab^2+b^3 $
\end{framed}

\begin{framed}
```

EXAMP

Part 2

QUEST

```latex
\end{framed}

\begin{framed}
$\sum_{k=1}^{n}k$ = $\frac{n(n+1)}{2}$
\end{framed}

\begin{framed}
$\frac{\Pi}{4}=\frac{1}{1}-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\frac{1}{9}-\frac{1}{11}+ \cdots$
\end{framed}
\end{frame}

\begin{frame}{Remaining parts of QUESTION 4}

\begin{framed}
$cos\theta$ = $sin(90^\circ - \theta)$
\end{framed}

\begin{framed}
$e^{i0}$ = $cos\theta + i sin\theta$
\end{framed}

\begin{framed}
$\lim_{\theta\rightarrow 0}\frac{sin\theta}{\theta}=1$
\end{framed}

\end{frame}

\begin{frame}{Remaining parts of QUESTION 4}

\begin{framed}
$\lim_{x \rightarrow\infty} \frac{\pi x}{x/logx}$ & = & 1.
\end{framed}

\begin{framed}
$\int_{ & - & \infty}^{\infty} e^{-x^2} dx $ & = & $\sqrt{\pi}$
\end{framed}

\end{frame}

\begin{frame}{QUESTION 5 : Typeset the following sentences.}
$\ast$ Positive numbers a,b and c are the side lengths of a triangle if and only if $a+b>c$ , $b+c>a$ & and &  $c+a>b$\\[0.20cm]
$\ast$ The area of a triangle with side lengths a,b,c is given by \emph{Heron's} \emph{formula}:\\
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EXAM

Part 2

QUES

```latex
$b+c>a$ & and & $c+a>b$\\[0.20cm]
$\ast$ The area of a triangle with side lengths a,b,c is given by \emph{Heron's} \emph{formula}:\\
\begin{center}
$A=\sqrt{s(s-a)(s-b)(s-c)},$ \\
\end{center}

where s is the semiperimeter $(a+b+c)/2$.\\[0.20cm]
$\ast$ The volume of a regular tetrahedron of edge length 1 is \sqrt{2}/12.\\[0.20cm]
$\ast$ The quadratic equation $ax^2+bx+c=0$ has roots
\begin{center}${r_1,r_2=\frac{-b\pm\sqrt{b^2-4ac}}{2a}}$
\end{center}
\end{frame}

\begin{frame}{Remaining parts of QUESTION 5}
$\ast$ The \emph{derivative} of a function f,denoted by $f^\prime$ , is \quad defined \quad by\\
\begin{center}
${f^\prime(x)=\lim_{h \rightarrow 0}\frac{f(x+h)-f(x)}{h}}$\\
\end{center}
$\ast$ A real-valued function f is convex on an interval I if \\
\begin{center}${f(\lambda x + (1-\lambda)y) \leq \lambda f(x) + (1-\lambda)f(y)},$\\
\end{center}
for all $x,y \in I$ and $0 \leq$ \lambda $\leq 1.$\\


$\ast$ The general solution to the differential equation \\
\begin{center}
$y''-3y'+2y=0$\\
\end{center}
is\\
\begin{center}
$y=C_1e^x+C_2e^2^x$.\\
\end{center}

$\ast$ The $Fermat$ $number$ $F_n$ is defined as\\
\begin{center}
\qquad{$F_n=2^{2^n} , n \geq 0.$}
\end{center}
\end{frame}
```

EXAMP

Part 2

QUEST

3^3

```latex

\begin{frame}{QUESTION 6}
\begin{framed}
$\frac{d}{dx} \left( \frac{x}{x+1} \right)= \frac{1}{(x+1)^2} $\\
\end{framed}
\begin{framed}
$\lim_{n \rightarrow \infty} \left( 1+ \frac{1}{n} \right)^n = e $\\
\end{framed}
\begin{framed}

$\left|
\begin{array}{cc}
a & b\\
c & d
\end{array}
\right| = ad-bc $\\

\end{framed}
\end{frame}

\begin{frame}{Remaining parts QUESTION 6}
\begin{framed}
$R_\theta =
\left[
\begin{array}{cc}
cos\theta & -sin\theta \\
sin\theta & cos\theta
\end{array}
\right]$\\

\end{framed}
\begin{framed}
$\left|
\begin{array}{ccc}
\textbf{i} & \textbf{j} &\textbf{k}\\
a_1 & a_2 & a_3\\
b_1 & b_2 & b_3
\end{array}
\right| = $
$\left|
\begin{array}{cc}
a_2 & a_3\\
b_2 & b_3
\end{array}
\right| \textbf{i} - $
$\left|
\begin{array}{cc}
a_1 & a_3\\
b_1 & b_3
\end{array}
```

```
\end{array}
\right| \textbf{j} + $
$\left|
\begin{array}{cc}
a_1 & a_2\\
b_1 & b_2
\end{array}
\right| \textbf{k} $
\end{framed}

\end{frame}

\begin{frame}{Remaining parts of QUESTION 6}
\begin{framed}
$\left[
\begin{array}{cc}
a_1_1 & a_1_2\\
a_2_1 & a_2_2
\end{array}
\right]$
$\left[
\begin{array}{cc}
b_1_1 & b_1_2 \\
b_2_1 & b_2_2
\end{array}
\right] = $
$\left[
\begin{array}{cc}
a_1_1 b_1_1+a_1_2 b_2_1 & a_1_1 b_1_2+a_1_2 b_2_2\\
a_2_1 b_1_1+a_2_2 b_2_1 & a_2_1 b_1_2+a_2_2 b_2_2
\end{array}
\right]$
\end{framed}
\begin{framed}
$f(x)=$
$\left\{
\begin{array}{cc}
-x^2, & x<0\\
x^2, & 0 \leq x\leq 2 \\
4, & x>2
\end{array}
\right\cdot$
\end{framed}
\end{frame}

\begin{frame}{QUESTION 7 : Part 1 }
\begin{framed}
\begin{center}
1+2 & = & 3 \\
4+5+6 & = & 7+8 \\
9+10+11+12 & = & 13+14+15 \\
16+17+18+19+20 & = & 21+22+23+24 \\
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9+10+11+12 & = & 13+14+15 \\
16+17+18+19+20 & = & 21+22+23+24 \\
25+26+27+28+29+30 & = & 31+32+33+34+35
\end{center}
\end{framed}
\end{frame}

\begin{frame}{Part 2}
\begin{framed}
\begin{align*}
    (a+b)^2 \quad & = \quad (a+b)(a+b)\\
    & = \quad (a+b)a + (a+b)b \\
    & = \quad a(a+b) + b(a+b) \\
    & = \quad a^2 + ab + ba + b^2 \\
    & = \quad a^2 + ab + ab + b^2 \\
    & = \quad a^2 + 2ab + b^2
\end{align*}
\end{framed}
\end{frame}


\begin{frame}{ Part 3}
\begin{framed}
\begin{align*}
    tan(\alpha +\beta + \gamma) \quad & = \quad \frac{tan(\alpha + \beta ) + tan\gamma}{1 - tan( \alpha + \beta ) tan\gamma} \\
    & = \quad \frac{\frac{tan\alpha + tan\beta}{1 - tan\alpha tan\beta}+tan\gamma}{1 - (\frac{tan\alpha + tan\beta}{1- tan\alpha tan\beta}) tan\gamma} \\
    & = \quad \frac{tan\alpha + tan\beta + ( 1 - tan\alpha tan\beta ) tan\gamma }{1 - tan\alpha tan\beta - (tan\alpha + tan\beta ) tan\gamma}\\
    & = \quad \frac{tan\alpha +tan\beta + tan\gamma - tan\alpha tan\beta tan\gamma}{1 - tan\alpha tan\beta - tan\alpha tan\gamma - tan\beta tan\gamma}
    \end{align*}
\end{framed}
\end{frame}

\begin{frame}{ Part 4}
\begin{framed}
\begin{align*}
    \prod_{p} ( 1- \frac{1}{p^2} ) \quad & = \prod_{p} \frac{1}{1+ \frac{1}{p^2} + \frac{1}{p^4} + \cdots }\\
    & = \quad ( \prod_{p} (1 + \frac{1}{p^2} + \frac{1}{p^4} + \cdots ) )^{-1}\\
    & = \quad ( 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \cdots )^{-1}\\
```

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    \end{align*}
\end{framed}
\end{frame}

\begin{frame}{ Part 4}
\begin{framed}
\begin{align*}
    \prod_{p} ( 1- \frac{1}{p^2} ) \quad & = \prod_{p} \frac{1}{1+ \frac{1}{p^2} + \frac{1}{p^4} + \cdots }\\
    & = \quad ( \prod_{p} (1 + \frac{1}{p^2} + \frac{1}{p^4} + \cdots ) )^{-1}\\
    & = \quad ( 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \cdots )^{-1}\\
    & = \quad \frac{6}{\pi ^2}
\end{align*}
\end{framed}
\end{frame}



\begin{frame}
\includegraphics[angle=15,scale=0.50]{Pic1.jpg}
\end{frame}
\end{document}
```

ASSIGNMENT 2

Sneha Paliwal

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University Roll no. = **20044563049**

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University of Delhi

EXAMPLE 9.5 : Part 1

- Let $\mathrm{x} = (x_1, \ldots, x_n)$, where the x_i are nonnegative real numbers. Set

$$M_r(\mathrm{x}) = \left(\frac{x_1^r + x_2^r + \cdots + x_n^r}{n} \right)^{1/r}, \quad r \in \mathrm{R} \setminus \{0\},$$

and

$$M_0(\mathrm{x}) = (x_1 x_2 \ldots x_n)^{1/n}.$$

We call $M_r(\mathrm{x})$ the *rth power mean* of x.
Claim : $\lim_{r \to 0} M_r(\mathrm{x}) = M_0(\mathrm{x})$.

Part 2

- Define

$$V_n = \begin{bmatrix} 1 & 1 & 1 & \dots & 1 \\ x_1 & x_2 & x_3 & \dots & x_n \\ x_1^2 & x_2^2 & x_3^2 & \dots & x_n^2 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ x_1^{n-1} & x_2^{n-1} & x_3^{n-1} & \dots & x_n^{n-1} \end{bmatrix}.$$

We call V_n the *Vandermonde matrix* of order n.
Claim:

$$\det V_n = \prod_{1 \le i < j \le n} (x_j - x_i).$$

QUESTION 4

$$3^3 + 4^3 + 5^3 = 6^3$$

$$\sqrt{100} = 10$$

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

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

$$\frac{\Pi}{4} = \frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \cdots$$

Remaining parts of QUESTION 4

$$cos\theta = sin(90^\circ - \theta)$$

$$e^{i0} = cos\theta + isin\theta$$

$$\lim_{\theta \to 0} \frac{sin\theta}{\theta} = 1$$

Remaining parts of QUESTION 4

$\lim_{x \to \infty} \frac{\pi x}{x / log x} \quad = \quad 1.$

$\int_{-\infty}^{\infty} e^{-x^2} dx \quad = \quad \sqrt{\pi}$

QUESTION 5 : Typeset the following sentences.

$*$ Positive numbers a,b and c are the side lengths of a triangle if and only if $a+b>c$, $b+c>a$ and $c+a>b$

$*$ The area of a triangle with side lengths a,b,c is given by *Heron's formula*:

$$A=\sqrt{s(s-a)(s-b)(s-c)},$$

where s is the semiperimeter $(a+b+c)/2$.

$*$ The volume of a regular tetrahedron of edge length 1 is $\sqrt{2}/12$.

$*$ The quadratic equation $ax^2+bx+c=0$ has roots

$$r_1,r_2=\tfrac{-b\pm\sqrt{b^2-4ac}}{2a}$$

Remaining parts of QUESTION 5

$*$ The *derivative* of a function f,denoted by f' , is defined by

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$*$ A real-valued function f is convex on an interval I if

$$f(\lambda x + (1 - \lambda)y) \leq \lambda f(x) + (1 - \lambda)f(y),$$

for all $x, y \in I$ and $0 \leq \lambda \leq 1$.

$*$ The general solution to the differential equation

$$y'' - 3y' + 2y = 0$$

is

$$y = C_1 e^x + C_2 e^{2x}.$$

$*$ The *Fermat number* F_n is defined as

$$F_n = 2^{2^n}, n \geq 0.$$

QUESTION 6

$$\frac{d}{dx}\left(\frac{x}{x+1}\right) = \frac{1}{(x+1)^2}$$

$$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n = e$$

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

Remaining parts QUESTION 6

$$R_\theta = \begin{bmatrix} cos\theta & -sin\theta \\ sin\theta & cos\theta \end{bmatrix}$$

$$\begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix} = \begin{vmatrix} a_2 & a_3 \\ b_2 & b_3 \end{vmatrix} \mathbf{i} - \begin{vmatrix} a_1 & a_3 \\ b_1 & b_3 \end{vmatrix} \mathbf{j} + \begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix} \mathbf{k}$$

Remaining parts of QUESTION 6

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} =$$
$$\begin{bmatrix} a_{11}b_{11} + a_{12}b_{21} & a_{11}b_{12} + a_{12}b_{22} \\ a_{21}b_{11} + a_{22}b_{21} & a_{21}b_{12} + a_{22}b_{22} \end{bmatrix}$$

$$f(x) = \begin{cases} -x^2, & x < 0 \\ x^2, & 0 \leq x \leq 2 \\ 4, & x > 2 \end{cases} .$$

QUESTION 7 : Part 1

$$
\begin{aligned}
1+2 &= 3\\
4+5+6 &= 7+8\\
9+10+11+12 &= 13+14+15\\
16+17+18+19+20 &= 21+22+23+24\\
25+26+27+28+29+30 &= 31+32+33+34+35
\end{aligned}
$$

Part 2

$$
\begin{aligned}
(a+b)^2 &= (a+b)(a+b) \\
&= (a+b)a + (a+b)b \\
&= a(a+b) + b(a+b) \\
&= a^2 + ab + ba + b^2 \\
&= a^2 + ab + ab + b^2 \\
&= a^2 + 2ab + b^2
\end{aligned}
$$

Part 3

$$
\begin{aligned}
tan(\alpha+\beta+\gamma) &= \frac{tan(\alpha+\beta)+tan\gamma}{1-tan(\alpha+\beta)tan\gamma} \\
&= \frac{\frac{tan\alpha+tan\beta}{1-tan\alpha tan\beta}+tan\gamma}{1-(\frac{tan\alpha+tan\beta}{1-tan\alpha tan\beta})tan\gamma} \\
&= \frac{tan\alpha+tan\beta+(1-tan\alpha tan\beta)tan\gamma}{1-tan\alpha tan\beta-(tan\alpha+tan\beta)tan\gamma} \\
&= \frac{tan\alpha+tan\beta+tan\gamma-tan\alpha tan\beta tan\gamma}{1-tan\alpha tan\beta-tan\alpha tan\gamma-tan\beta tan\gamma}
\end{aligned}
$$

Part 4

$$\begin{aligned}\prod_p \left(1 - \frac{1}{p^2}\right) &= \prod_p \frac{1}{1 + \frac{1}{p^2} + \frac{1}{p^4} + \cdots} \\ &= \left(\prod_p \left(1 + \frac{1}{p^2} + \frac{1}{p^4} + \cdots\right)\right)^{-1} \\ &= \left(1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \cdots\right)^{-1} \\ &= \frac{6}{\pi^2}\end{aligned}$$


Thank
You