Assignment

Source Rich Text

```latex
\documentclass[aspectratio=1610]{beamer}
\usepackage[utf8]{inputenc}
\usetheme{Bergen}
\usecolortheme{spruce}

\usepackage{xcolor}
\usepackage{graphicx}
\usepackage[T1]{fontenc}
\usepackage{tgtermes}
\title{\textbf {ASSIGNMENT}}
\institute{{\large \textcolor{olive}{Mata Sundri College For Women}}\\{\normalsize \textcolor{red}{University of Delhi}}}
\author{\Large{\textcolor{teal}{{\fontfamily{qtm}\selectfont {Ishita}}}\\{\small \textcolor{violet}{MAT/20/98}} \and\\{\small \textcolor{violet}{20044563024}}}}
\date{}
\begin{document}
\begin{frame}
\titlepage
\end{frame}
\begin{frame}
1.Let x=$(x_1,\ldots,x_n)$, where the $x_1$ are non negative real numbers. Set $$M_r(x)=\left(\frac{x_1^r+x_2^r+\cdots+x_n^r}{n}\right)^{1/r}, r \in R \backslash
\{0\},$$ and $$M_0(x)=(x_1x_2\ldots x_n)^{1/n}. $$
We call $M_r(x)$ \emph{rth power mean of x.} \\ \vspace{0.2in}
Claim : $$\lim_{r\rightarrow 0} M_r(x)=M_0(x). $$
\end{frame}
\begin{frame}
2. Define
$$V_n=\left[\begin{array}{ccccc}
1&1&1&\ldots&1\\
x_1&x_2&x_3^2&\ldots&x_n\\
x_1^2&x_2^2&x_3^2&\ldots&x_n^2\\
\vdots&\vdots&\vdots&\ddots&\vdots\\
x_1^{n-1}&x_2^{n-1}&x_3^{n-1}&\ldots&x_n^{n-1}
\end{array}\right]$$
We call $V_n$ the \emph{Vandermonde matrix} of order \emph{n}.\\
Claim:

$$\det V_n=\prod_{1\leq i<j\leq n}(x_j-x_i).$$
\end{frame}
\begin{frame}{Q4. Make the following equations.}
\begin{itemize}
    \item $$3^3+4^3+5^3=6^3$$
    \item $$\sqrt{100}=10$$
    \item $$(a+b)^3=a^3+3a^2b+3ab^2+b^3$$
    \item $$\sum^{n}_{k=1} k=\frac{n(n+1)}{2}$$
    \item $$\frac{\pi}{4}=\frac{1}{1}-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\frac{1}{9}-\frac{1}{11}+\cdots$$
Click to show the file-tree
\end{frame}
\begin{frame}{Remaining parts of Q4}
\begin{itemize}
    \item $$\cos\theta=\sin(90^o-\theta)$$
    \item $$e^{i\theta}=\cos\theta+i\sin\theta$$
    \item $$\lim_{\theta \rightarrow 0} \frac{\sin\theta}{\theta}=1$$
    \item $$\lim_{x \rightarrow \infty} \frac{\pi(x)}{x\log x}=1$$
    \item $$\int^{\infty}_{-\infty} e^{-x^2} dx=\sqrt{\pi}$$
\end{itemize}
\end{frame}
\begin{frame}{Q5. TypeSet the following sentences.}
\begin{itemize}
    \item Positive numbers a,b, and c are the side lengths of a triangle if and only if $a+b > c, b+c > a$, and $c+a > b$.
    \item The area of a triangle with side lengths \emph{a,b,c} is given by \emph{Heron's formula :}
    $$A= \sqrt{s(s-a)(s-b)(s-c)}$$\\
    where \emph{s} is the the semi-perimeter \emph{(a+b+c)/2}.
    \item The volume of a regular tetrahedron of edge length 1 is $\sqrt{2}/12$.
    \item The Quadratic equation $ax^2+bx+c=0$ has roots\\
    $$r_1,r_2=\frac{-b \pm\sqrt{b^2-4ac}}{2a}$$
\end{itemize}
\end{frame}
\begin{frame}{Remaining parts of Q5}
\begin{itemize}
    \item The \emph{derivative} of a function \emph{f}, denoted $f'$, is defined by \\$$f'(x)=\lim_{h\rightarrow 0}
    \frac{f(x+h)-f(x)}{h}$$
    \item A real-valued function \emph{f} is \emph{convex} on interval \emph{I} if\\ $$f(\lambda x+(1-\lambda)y)\leq\lambda
    f(x)+(1-\lambda)f(y)$$ for all \emph{x,y} $\in$ \emph{I} and $0 \leq\lambda\leq1$
    \item The general solution to the differential equation
    $$y"-3y'+2y=0$$
    is $$y=C_1 e^2x+C_2 e^2{2x}$$
    \item The \emph{Fermat Number} $F_n$ is defined as $$F_n=2^{2^n},n\geq0$$
\end{itemize}
\end{frame}
\begin{frame}{Q6. Make the following equations. Notice the large delimiters.}
\begin{itemize}
    \item $$\frac{d}{dx}\left(\frac{x}{x+1}\right)=\frac{1}{(x+1)^2}$$
    \item $$\lim_{n\rightarrow \infty}\left(1+\frac{1}{n}\right)^n=e$$
    \item $$\left|\begin{array}{cc}
    a&b\\
    c&d\end{array}\right|=ad-bc$$
    \item $$R_\theta=\left[\begin{array}{cc}
    \cos\theta&-\sin\theta\\
    \sin\theta&\cos\theta
    \end{array}\right]$$
\end{itemize}
\end{frame}
\begin{frame}{Remaining parts of Q6}
\begin{itemize}
```

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    \item $$\frac{d}{dx}\left(\frac{x}{x+1}\right)=\frac{1}{(x+1)^2}$$
    \item $$\lim_{n\rightarrow \infty}\left(1+\frac{1}{n}\right)^n=e$$
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    \sin\theta&\cos\theta
    \end{array}\right]$$
\end{itemize}
\end{frame}
\begin{frame}{Remaining parts of Q6}
\begin{itemize}
    \item $$\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}\right|\textbf{j}+\left|\begin{array}{cc}
    a_1&a_2\\
    b_1&b_2 \end{array}\right|\textbf{k}$$

    \item$$\left[\begin{array}{cc}
    a_{11}&a_{12}\\
    a_{21}&a_{22} \end{array}\right]\left[\begin{array}{cc}
    b_{11}&b_{12}\\
    b_{21}&b_{22}
    \end{array}\right]=\left[\begin{array}{lr}
    a_{11}b_{11}+a_{12}b_{21}& a_{11}b_{12}+a_{12}b_{22}\\
    a_{21}b_{11}+a_{22}b_{21}& a_{21}b_{12}+a_{22}b_{22}\end{array}\right]$$

    \item $$f(x)=\left\{\begin{array}{lc}-x^2,& x<0\\
    x^2,& 0\leq x\leq 2\\
    4,&x >2\end{array}\right.$$
    \end{itemize}
\end{frame}
\begin{frame}{Q7. Make the following multi-line equations.}
\begin{eqnarray*}
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{frame}
\begin{frame}{Q7 cntd...}
\begin{eqnarray*}
(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{eqnarray*}
\end{frame}
\begin{frame}{Q7 cntd...}
\begin{eqnarray*}
\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-\left(\frac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}\right)\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{eqnarray*}
\end{frame}
\begin{frame}{Q7 cntd...}
\begin{eqnarray*}
\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{eqnarray*}
\end{frame}
\begin{frame}
\includegraphics[scale=1.2]{images.png}
\end{frame}
\end{document}
```

ASSIGNMENT

Who? Ishita

MAT/20/98

20044563024

From? Mata Sundri College For Women
University of Delhi

1.Let x=$(x_1, \ldots, x_n)$, where the x_1 are non negative real numbers. Set

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

and

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

We call $M_r(x)$ *rth power mean of x.*

Claim :

$$\lim_{r \to 0} M_r(x) = M_0(x).$$

2. Define

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

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

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

Q4. Make the following equations.

- $$3^3 + 4^3 + 5^3 = 6^3$$
- $$\sqrt{100} = 10$$
- $$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$
- $$\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$$
- $$\frac{\pi}{4} = \frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \cdots$$

Remaining parts of Q4

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

$$e^{i\theta} = \cos\theta + i\sin\theta$$

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

$$\lim_{x\to\infty}\frac{\pi(x)}{x\log x} = 1$$

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

Q5. 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 the semi-perimeter *(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

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

Remaining parts of Q5

- The *derivative* of a function f, denoted 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 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

$$y = C_1 e^2 x + C_2 e^2 2x$$

- The *Fermat Number* F_n is defined as

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

Q6. Make the following equations. Notice the large delimiters.

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

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

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

- $$R_\theta = \left[\begin{array}{cc} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{array}\right]$$

Remaining parts of Q6

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

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

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

Q7. Make the following multi-line equations.

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

Q7 cntd...

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

Q7 cntd...

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

Q7 cntd...

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


THANK YOU
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