



Project2



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1 \documentclass[10pt]{beamer}
2 \usepackage[utf8]{inputenc}
3 \usepackage{mathtools}
4 \usepackage{fancybox}
5 \usepackage{graphicx}
6 \usetheme{Berlin}
7 \useoutertheme{shadow}
8 \useinnertheme{circles}
9 \usefonttheme{serif}
10 \begin{document}
11 \date{}
12 \setbeamertemplate{background}{\includegraphics[width=\paperwidth,height=\paperheight]{t2.jpg}}
13 \title[Mata Sundri College for Women, (University of Delhi)]{Document}
14 \author[Shveta]{\Large
\textbf{\textit{\color{blue}\shadowbox{Shveta}}}}\vskip0.4cm\textit{\large
\textbf{\color{blue}College Roll no. - \color{red}
MAT/20/132\ \color{blue}University Roll no. -
\color{red}20044563057}}
15 \institute{\textit{\textbf{\large\ \color{blue}Mata
Sundri College for Women\ \color{red}(University of
Delhi)}}}}
16 \begin{frame}{LaTeX Presentation}
17 \titlepage
18 \end{frame}
19 %next slide
20 \begin{frame}{Content of the page no. 69}
21 \begin{enumerate}
22 \item Let  $\mathbf{x}=(x_1,\dots,x_n)$ ,
where the  $x_i$  are non-negative real
numbers.
23 Set
24 
$$M_r(\mathbf{x})=\left(\frac{x_1^r+x_2^r+\cdots+x_n^r}{n}\right)^{1/r},\ ;\ ;\ ;\ r\in\mathbf{R}\setminus\{0\},\ \}
25 \text{and}$$

26 
$$M_0(\mathbf{x})=\left(x_1x_2\cdots x_n\right)^{1/n}.$$

27 We call  $M_r(\mathbf{x})$  the  $r$ th power mean of  $\mathbf{x}$ .

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27 We call $M_r(\mathbf{x})$ the r th power mean of \mathbf{x} . \\

28 Claim:

29 $\lim_{r \rightarrow 0} M_r(\mathbf{x}) = M_0(\mathbf{x})$. \\

30 $\end{enumerate}$

31 \end{frame}

32 \begin{frame}

33 $\begin{enumerate}[2]$

34 \item

35 Define

36 $[V_n =$

37 $\left[$

38 $\begin{array}{cccc} 1 & 1 & 1 & \cdots & 1 \\ x_1 & x_2 & x_3 & \cdots & x_n \\ x_1^2 & x_2^2 & x_3^2 & \cdots & x_n^2 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ x_1^{n-1} & x_2^{n-1} & x_3^{n-1} & \cdots & x_n^{n-1} \end{array}$

39 $1 & 1 & 1 & \cdots & 1 \\$

40 $x_1 & x_2 & x_3 & \cdots & x_n \\$

41 $x_1^2 & x_2^2 & x_3^2 & \cdots & x_n^2 \\$

42 $\vdots & \vdots & \vdots & \ddots & \vdots \\$

43 $x_1^{n-1} & x_2^{n-1} & x_3^{n-1} & \cdots & x_n^{n-1}$

44 \end{array}

45 $\right]$

46 We call V_n the Vandermonde matrix of order n . \\

47 Claim: $\det V_n = \prod_{1 \leq i < j \leq n} (x_j - x_i)$

48 $\left(x_j - x_i\right)$. \\

49 $\end{enumerate}$

50 \end{frame}

51 \begin{frame}

52 $\begin{itemize}$

53 $\item [3^3+4^3+5^3=6^3]$

54 $\item [\sqrt{100}=10]$

55 $\item [\left(a+b\right)^3 = a^3+3a^2$

56 $b+3ab^2+b^3]$

57 $\item [\sum_{k=1}^n k = \frac{n(n+1)}{2}]$

58 $\item [\frac{\pi^4}{4} = \frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \dots]$

59 $\end{itemize}$

60 \end{frame}

61 \begin{frame}

62 $\begin{itemize}$

63 \item





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60 \begin{itemize}
61   \item [\cos\theta=\sin(90^\circ-\theta)]
62   \item [e^{i\theta}=\cos\theta+i\sin\theta]
63   \item [\lim_{\theta\rightarrow\infty}\frac{\sin n\theta}{n\theta}]{\theta}=1]
64   \item [\lim_{x\rightarrow\infty}\frac{\pi(x)}{x\log x}=1]
65   \item [\int_{-\infty}^{\infty}e^{-x^2}dx = \sqrt{\pi}]
66 \end{itemize}
67 \end{frame}
68 \begin{frame}{Question 5}
69 \begin{itemize}
70   \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 $c+a > b$.
71   \item The area of a triangle with side lengths a, b, c is given by Heron's formula:
72   [\mathbf{A}= \sqrt{s(s-a)(s-b)(s-c)}],
73   where s is the semiperimeter (a+b+c)/2.
74   \item The volume of a regular tetrahedron of edge length 1 is $\sqrt{2}/12$.
75   \item The quadratic equation $ ax^2+bx+c = 0$ has roots $[r_1,r_2=\frac{-b\pm\sqrt{b^2-4ac}}{2a}]$.
76 \end{itemize}
77 \end{frame}
78 \begin{frame}{Remaining parts of Ques.5}
79 \begin{itemize}
80   \item The derivative of a function f, denoted f', is defined by $[f'(x)=\lim_{h\rightarrow 0}\frac{f(x+h)-f(x)}{h}]$.
81   \item A real-valued function f is convex on an interval I if $[f(\lambda x + (1-\lambda)y)\le\lambda f(x)+(1-\lambda)f(y)]$ for all $x,y \in I$ and $0\le\lambda\le 1$.
82   \item The general solution to the differential equation $[y''-3y'+2y=0]$ is $[y=C_1e^x+C_2e^{2x}]$.
83 \end{itemize}
84 \end{frame}
85 \end{frame}

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86 \begin{frame}{Remaining parts of Ques.5}
87 \begin{itemize}
88 \item The \emph{Fermat number}  $F_n$  is
      defined as  $[F_n=2^{2^n}, n \geq 0.]$ 
89 \end{itemize}
90 \end{frame}
91 \begin{frame}{Question 6}
92 \begin{itemize}
93 \item  $[\frac{d}{dx} \left( \frac{x}{x+1} \right) = \frac{1}{(x+1)^2}]$ 
94 \item  $[\lim_{n \rightarrow \infty} \left( 1 + \frac{1}{n} \right)^n = e]$ 
95 \item  $[\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc]$ 
96 \item  $[R_{\theta} = \begin{bmatrix} \cos \theta & \\ -\sin \theta & \end{bmatrix} \begin{bmatrix} \sin \theta & \\ \cos \theta & \end{bmatrix}]$ 
97 \end{itemize}
98 \end{frame}
99 \begin{frame}{ Remaining parts of Ques.6}
100 \begin{itemize}
101 \item  $[\begin{vmatrix} \text{bf}{i} & \text{bf}{j} & \text{bf}{k} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix} = \begin{vmatrix} a_2 & a_3 \\ b_2 & b_3 \end{vmatrix} \text{bf}{i} - \begin{vmatrix} a_1 & a_3 \\ b_1 & b_3 \end{vmatrix} \text{bf}{j} + \begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix} \text{bf}{k}]$ 
102 \item  $[\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} = \begin{bmatrix} a_{11}b_{11} + a_{12}b_{21} & a_{11}b_{12} + a_{12}b_{22} \\ a_{21}b_{11} + a_{22}b_{21} & a_{21}b_{12} + a_{22}b_{22} \end{bmatrix}]$ 
103 \item  $[\text{left} \{ \begin{array}{l} -x^2 \text{ \& } x < 0 \\ x^2 \text{ \& } 0 \leq x \leq 2 \\ 4 \text{ \& } x > 2 \end{array} \right. \text{right.}]$ 
104 \end{itemize}
105 \end{frame}
106 \begin{frame}{Question 7(1)}
107 \begin{align*}
108 1+2 &= 3
109 \end{align*}
110 \end{frame}

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112 \begin{align*}
113   1+2 &=3 \\
114   4+5+6 &=7+8 \\
115   9+10+11+12 &=13+14+15 \\
116   16+17+18+19+20 &=21+22+23+24 \\
117   25+26+27+28+29+30 &=31+32+33+34+35 \\
118 \end{align*}
119 \end{frame}
120 \begin{frame}{Question 7(2)}
121 \begin{align*}
122   (a+b)^2 &= (a+b)(a+b) \\
123   &= (a+b)a + (a+b)b \\
124   &= a(a+b) + b(a+b) \\
125   &= a^2 + ab + ba + b^2 \\
126   &= a^2 + ab + ab + b^2 \\
127   &= a^2 + 2ab + b^2 \\
128 \end{align*}
129 \end{frame}
130 \begin{frame}{Question 7(3)}
131 \begin{align*}
132   \tan(\alpha + \beta + \gamma) &= \frac{\tan(\alpha + \beta) + \tan \gamma}{1 - \tan(\alpha + \beta) \tan \gamma} \\
133   &= \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} \\
134   &= \frac{\tan \alpha + \tan \beta + (1 - \tan \alpha \tan \beta) \tan \gamma}{1 - \tan \alpha \tan \beta - (\tan \alpha + \tan \beta) \tan \gamma} \\
135   &= \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} \\
136 \end{align*}
137 \end{frame}
138 \begin{frame}{Question 7(4)}
139 \begin{align*}
140   \prod_p \left( 1 - \frac{1}{p^2} \right) &= \prod_p \frac{1}{1 + \frac{1}{p^2} + \frac{1}{p^4} + \dots} \\
141   &= \left( \prod_p \left( 1 + \frac{1}{p^2} + \frac{1}{p^4} + \dots \right) \right)^{-1} \\
142   &= \left( 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots \right)^{-1}

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129 \end{frame}
130 \begin{frame}{Question 7(3)}
131 \begin{align*}
132 \quad \tan(\alpha+\beta+\gamma)&=\frac{\tan(\alpha+\beta)
&+\tan\gamma}{1-\tan(\alpha+\beta)\tan\gamma}\backslash
133 \quad &=\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}\backslash\backslash
134 \quad &=\frac{\tan\alpha+\tan\beta+(1-\tan\alpha
\tan\beta)\tan\gamma}{1-\tan\alpha\tan\beta-(\tan
\alpha+\tan\beta)\tan\gamma}\backslash\backslash
135 \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}
136 \quad \end{align*}
137 \quad \end{frame}
138 \begin{frame}{Question 7(4)}
139 \begin{align*}
140 \quad \prod_p
&\left(1-\frac{1}{p^2}\right)&=\prod_p\frac{
1}{1+\frac{1}{p^2}+\frac{1}{p^4}+\cdots}\backslash\backslash
141 \quad &=\left(\prod_p\left(1+\frac{1}{p^2}+\frac{
1}{p^4}+\cdots\right)\right)^{-1}\backslash\backslash
142 \quad &=\left(1+\frac{1}{2^2}+\frac{1}{3^2}+\frac{
1}{4^2}+\cdots\right)^{-1}\backslash\backslash
143 \quad &=\frac{6}{\pi^2}
144 \quad \end{align*}
145 \quad \end{frame}
146 \begin{frame}
147 \quad \vfill
148 \quad \centering
149 \quad \shadowbox{
150 \quad \fontsize{45}{42}\selectfont\rotatebox{0}{\color{red}Thank You!}}
151 \includegraphics[angle=10,width=1.5in,height=1.5in]{smiley.png}
152 \quad \end{frame}
153 \end{document}
154

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Document

Shveta

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(University of Delhi)

- ① Let $\mathbf{x} = (x_1, \dots, x_n)$, where the x_i are non-negative real numbers.
Set

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

and

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

We call $M_r(\mathbf{x})$ the *r*th power mean of \mathbf{x} .

Claim:

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

2 Define

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

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

Claim:

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

Question. 4

•

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

•

$$\sqrt{100} = 10$$

•

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

•

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

•

$$\frac{\pi}{4} = \frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \dots$$

Remaining parts of Ques.4

-
-
-
-
-

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

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

$$\lim_{\theta \rightarrow \infty} \frac{\sin \theta}{\theta} = 1$$

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

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

Question 5

- 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

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

Remaining parts of Ques.5

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

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

- 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

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

Remaining parts of Ques.5

- The *Fermat number* F_n is defined as

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

Question 6

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

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

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

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

Remaining parts of Ques.6

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

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

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

Question 7(1)

$$1 + 2 = 3$$

$$4 + 5 + 6 = 7 + 8$$

$$9 + 10 + 11 + 12 = 13 + 14 + 15$$

$$16 + 17 + 18 + 19 + 20 = 21 + 22 + 23 + 24$$

$$25 + 26 + 27 + 28 + 29 + 30 = 31 + 32 + 33 + 34 + 35$$

Question 7(2)

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

Question 7(3)

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

Question 7(4)

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

Thank You!

