



Assignment-2

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1 \documentclass{beamer}
2 \usepackage[utf8]{inputenc}
3 \usepackage[T1]{fontenc}
4 \usepackage{graphicx}
5 \title{Assignment-2}
6 \author{\emph{Kanupriya Kuntal}}
7 \date{}
8 \institute{\color{olive}\textbf{\huge{Mata Sundri
Collage}}\ \underline{\textbf{\huge{University of Delhi}}}}
9 \usepackage{xcolor}
10 \usetheme{Berkeley}
11 \usecolortheme{wolverine}
12 \begin{document}
13 {\setbeamercolor{background canvas}{bg=green!20}}
14 \begin{frame}
15 \titlepage
16 \begin{center}
17 \color{magenta}{\textbf{\LARGE{Collage Roll no. -
MAT/20/23}}}\
18 \textbf{\LARGE{University Roll no. - 20044563001}}
19 \end{center}
20 \end{frame}
21 {\setbeamercolor{background canvas}{bg=red!60}}
22 \begin{frame}{\textbf{Page-69}}
23 1. Let  $x = (x_1, \dots, x_n)$ , where the  $x_i$  are non
negative real numbers. \Set

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


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

24 We call  $M_r(x)$  \emph{rth power mean of x.} \
\vspace{0.2in}
25 Claim :  $\lim_{r \rightarrow 0} M_r(x) = M_0(x).$ 
26 \end{frame}
27 {\setbeamercolor{background canvas}{bg=pink!50}}
28 \begin{frame}{\textbf{Page-69}}
29 2. Define
30 
$$V_n = \begin{bmatrix} 1 & 1 & 1 & \dots & 1 \\ x_1 & x_2 & x_3 & \dots & x_n \\ x_1^2 & x_2^2 & x_3^2 & \dots & x_n^2 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ x_1^{n-1} & x_2^{n-1} & x_3^{n-1} & \dots & x_n^{n-1} \end{bmatrix}$$

36 \end{array} \right)
37 We call  $V_n$  the \emph{Vandermonde matrix} of order
\emph{n}.

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38 Claim :
39
40 
$$\det V_n = \prod_{1 \leq i < j \leq n} (x_j - x_i)$$

41 \end{frame}}
42 {\setbeamercolor{background canvas}{bg=orange!100}}
43 \begin{frame}{\textbf{Question-4}}
44 \begin{itemize}
45 \item  $3^3 + 4^3 + 5^3 = 6^3$ 
46 \item  $\sqrt{100} = 10$ 
47 \item  $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ 
48 \item  $\sum_{k=1}^n k = \frac{n(n+1)}{2}$ 
49 \item  $\frac{\pi}{4} = \frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \dots$ 
50 \end{itemize}
51 \end{frame}}
52 {\setbeamercolor{background canvas}{bg=blue!50}}
53 \begin{frame}{\textbf{Question-4}}
54 \begin{itemize}
55 \item  $\cos \theta = \sin(90^\circ - \theta)$ 
56 \item  $e^{i\theta} = \cos \theta + i \sin \theta$ 
57 \item  $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$ 
58 \item  $\lim_{x \rightarrow \infty} \frac{\pi(x)}{x \log x} = 1$ 
59 \item  $\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$ 
60 \end{itemize}
61 \end{frame}}
62 {\setbeamercolor{background canvas}{bg=magenta!40}}
63 \begin{frame}{\textbf{Question-5}}
64 \begin{itemize}
65 \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  $c+a > b$ .
66 \item The area of a triangle with side lengths  $a, b, c$  is given by Heron's formula :
67 
$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

68 where  $s$  is the semi-perimeter  $\frac{(a+b+c)}{2}$ .
69 \item The volume of a regular tetrahedron of edge length 1 is  $\frac{\sqrt{2}}{12}$ .
70 \item The quadratic equation  $ax^2 + bx + c = 0$  has roots  $r_1, r_2 = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ 
71 \end{itemize}
72 \end{frame}}
73 {\setbeamercolor{background canvas}{bg=brown!50}}
74 \begin{frame}{\textbf{Question-5}}
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73 {\setbeamercolor{background canvas}{bg=brown!50}
74 \begin{frame}{\textbf{Question-5}}
75 \begin{itemize}
76 \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}$$
77 \item A real- valued function \emph{f} is \emph{convex}
on interval \emph{I} if\\ $$f(\lambda
x+(1-\lambda)y)\leq\lambda f(x)+(1-\lambda)f(y)$$, for
all \emph{x,y} $\in$ \emph{I} and $0 \leq\lambda\leq 1$.
78 \item The general solution to the differential equation
79 $$y''-3y'+2y=0$$
80 is $$y=C_1 e^x+C_2 e^{2x}$$
81 \item The \emph{Fermat number} $F_n$ is defined as
82 $$F_n=2^{2^n}, n\geq 0$$.
83 \end{itemize}
84 \end{frame}
85 {\setbeamercolor{background canvas}{bg=green!20}
86 \begin{frame}{\textbf{Question-6}}
87 \begin{itemize}
88 \item $$\frac{d}{dx}\left(\frac{x}{x+1}\right)=\frac{1}{(x+1)^2}$$
89 \item $$\lim_{n\rightarrow
\infty}\left(1+\frac{1}{n}\right)^n=e$$
90 \item $$ \left| \begin{array}{cc}
91 a&b\\
92 c&d\end{array}\right|=ad-bc $$
93 \item $$R_\theta = \left[ \begin{array}{cc}
94 \cos\theta&-\sin\theta\\
95 \sin\theta&\cos\theta
96 \end{array}\right]$$
97 \end{itemize}
98 \end{frame}
99 {\setbeamercolor{background canvas}{bg=cyan!100}
100 \begin{frame}{\textbf{Question-6}}
101 \begin{itemize}
102 \item $$ \left| \begin{array}{ccc}
103 \textbf{i}&\textbf{j}&\textbf{k}\\
104 a_1&a_2&a_3\\
105 b_1&b_2&b_3
106 \end{array}\right|=\left| \begin{array}{cc}
107 a_2&a_3\\
108 b_2&b_3\end{array}\right|\textbf{i}-\left| \begin{array}{cc}
109 a_1&a_3\\
110 b_1&b_3\end{array}\right|\textbf{j}+\left| \begin{array}{cc}
111 a_1&a_2\\
112 b_1&b_2\end{array}\right|\textbf{k}$$

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101 \begin{itemize}
102   \item $$ \left| \begin{array}{ccc}
103     \textbf{i}&\textbf{j}&\textbf{k} \\
104     a_1&a_2&a_3 \\
105     b_1&b_2&b_3 \\
106   \end{array} \right| = \left| \begin{array}{cc}
107     a_2&a_3 \\
108     b_2&b_3 \end{array} \right| \textbf{i} - \left| \begin{array}{c}
109     a_1&a_3 \\
110     b_1&b_3 \end{array} \right| \textbf{j} + \left| \begin{array}{c}
111     a_1&a_2 \\
112     b_1&b_2 \end{array} \right| \textbf{k} $$
113   \item $$ \left[ \begin{array}{cc}
114     a_{11}&a_{12} \\
115     a_{21}&a_{22} \end{array} \right] \left[ \begin{array}{cc}
116     b_{11}&b_{12} \\
117     b_{21}&b_{22} \end{array} \right] = \left[ \begin{array}{lr}
118     a_{11}b_{11}+a_{12}b_{21}&a_{11}b_{12}+a_{12}b_{22} \\
119     a_{21}b_{11}+a_{22}b_{21}&a_{21}b_{12}+a_{22}b_{22} \end{array} \right]
120   \item $$ f(x) = \begin{cases}
121     -x^2, & x < 0 \\
122     x^2, & 0 \leq x \leq 2 \\
123     4, & x > 2
124   \end{cases}
125 \end{itemize}
126 \end{frame}
127 {\setbeamercolor{background canvas}{bg=pink!100}}
128 \begin{frame}{\textbf{Question-7(i)}}
129   $$ 1+2=3 $$
130   $$ 4+5+6=7+8 $$
131   $$ 9+10+11+12=13+14+15 $$
132   $$ 16+17+18+19+20=21+22+23+24 $$
133   $$ 25+26+27+28+29+30=31+32+33+34+35 $$
134 \end{frame}
135 {\setbeamercolor{background canvas}{bg=violet!50}}
136 \begin{frame}{\textbf{Question-7(ii)}}
137 \begin{eqnarray}
138 (a+b)^2 &= & (a+b)(a+b) \text{\nonumber} \\
139 &= & (a+b)a + (a+b)b \text{\nonumber} \\
140 &= & a(a+b) + b(a+b) \text{\nonumber} \\
141 &= & a^2 + ab + ba + b^2 \text{\nonumber} \\
142 &= & a^2 + ab + ab + b^2 \text{\nonumber} \\
143 &= & a^2 + 2ab + b^2 \text{\nonumber}

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137 \begin{eqnarray}
138 (a+b)^2&=&(a+b)(a+b)\nonumber\\
139 &=&(a+b)a+(a+b)b\nonumber\\
140 &=&a(a+b)+b(a+b)\nonumber\\
141 &=&a^2+ab+ba+b^2\nonumber\\
142 &=&a^2+ab+ab+b^2\nonumber\\
143 &=&a^2+2ab+b^2\nonumber
144 \end{eqnarray}
145 \end{frame}}
146 {\setbeamercolor{background canvas}{bg=teal!100}}
147 \begin{frame}{\textbf{Question-7(iii)}}
148 \begin{eqnarray}
149 \tan(\alpha + \beta + \gamma) &=& \frac{\tan(\alpha
+ \beta) + \tan \gamma}{1 - \tan(\alpha
+ \beta) \tan \gamma} \nonumber \\
150 &=& \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} \nonumber \\
151 &=& \frac{\tan \alpha + \tan \beta + (1 - \tan \alpha
\tan \beta) \tan \gamma}{1 - \tan \alpha \tan \beta
- (\tan \alpha + \tan \beta) \tan \gamma} \nonumber \\
152 &=& \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} \nonumber
153 \end{eqnarray}
154 \end{frame}}
155 {\setbeamercolor{background canvas}{bg=olive!100}}
156 \begin{frame}{\textbf{Question-7(iv)}}
157 \begin{eqnarray}
158 \prod_p \left(1 - \frac{1}{p^2}\right) &=& \prod_p
\frac{1}{1 + \frac{1}{p^2} + \frac{1}{p^4} + \cdots} \nonumber \\
159 &=& \left( \prod_p
\left(1 + \frac{1}{p^2} + \frac{1}{p^4} + \cdots\right)
\right)^{-1} \nonumber \\
160 &=& \left( 1 + \frac{1}{2^2} + \frac{1}{2^4} + \cdots
\right)^{-1} \nonumber \\
161 &=& \frac{6}{\pi^2} \nonumber
162 \end{eqnarray}
163 \end{frame}}
164 \setbeamercolor{background canvas}{bg=red!50}
165 \begin{frame}{}
166 \centering \color{teal}{\textbf{\Huge{THANK YOU}}}
167 \end{frame}
168 \end{document}
169

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