

Presentation

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Example-9.5 (Part-1)

- Let $\mathbf{x} = (x_1, \dots, x_n)$, where the x_i are nonnegative 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

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

We call $M_r(\mathbf{x})$ the *rth power mean* of \mathbf{x} . Claim:

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

Example-9.5 (Part-2)

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

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

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

Q4. Make the following equations.

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

- $$\sqrt{100} = 10$$

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

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

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

Remaining parts of question 4



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



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



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



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



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

Q 5. Typeset the following sentences.

- Positive numbers $a, b,$ and c are the side lengths of a triangle if and only if $a + b > c, b + c > 0,$ 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 $\sqrt{2}/12.$

Remaining parts of question 5

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

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

- The derivative of a function f , denoted by 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 $0 \leq \lambda \leq 1$.

Remaining parts of question 5

- 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

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

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

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

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

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

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

Remaining parts of question 6



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



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



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

Q7. Make the following multi-line equations.



$$1 + 2 = 3$$

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

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

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

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



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



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



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



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1 \documentclass{beamer}
2 \usepackage[utf8]{inputenc}
3 %\usetheme{Madrid}
4 \usepackage{gensymb}
5 \usepackage{fancybox}
6 \usepackage{xcolor}
7 \setbeamercolor{titlelike}{parent=structure,bg=teal}
8 \title{\textbf{Presentation}}
9 \author{\Large {\textcolor{teal}{Anisha Choudhary}}\{\small \textcolor{orange}{MAT/20/88}}
\and\{\small\textcolor{violet}{20044563014}}}}
10 \date{}
11 \institute{\{\large \textcolor{cyan}{Mata Sundri College For Women}}\{\normalsize \textcolor{red}{University of Delhi}}}}
12 \usecolortheme{orchid}
13 \settheme{Warsaw}
14 \usepackage{graphicx}
15 \begin{document}
16 \beamertemplateshadingbackground{green!20}{red!20}
17 \begin{frame}
18 \titlepage
19 \end{frame}
20
21 \begin{frame}{Example-9.5 (Part-1)}
22 \begin{itemize}
23 \item Let  $\mathbf{x}=(x_1,\dots,x_n)$ ,
24 where the  $x_i$ s are nonnegative real numbers.
25 Set
26 \[
27 M_r(\mathbf{x}) = \left(\frac{x_1^r+x_2^r
+\dots+x_n^r}{n}\right)^{1/r},
28 \]; \];  $r \in \mathbf{R}$  \setminus \{0\},
29 \]
30 and
31 \[
32 M_0(\mathbf{x})=\left(x_1 \cdot x_2 \cdot \dots \cdot x_n\right)^{1/n}
33 \]
34 We call  $M_r(\mathbf{x})$  the  $r$ th power mean
35 of  $\mathbf{x}$ .
36 Claim:
37 \[ \lim_{r \rightarrow 0} M_r(\mathbf{x})=M_0(\mathbf{x}). \]
38 \end{itemize}
39 \end{frame}
40 \dots
41 \vskip 0.5cm
42
43
44 \begin{frame}{Example-9.5 (Part-2)}
45 \[
46 V_n=
47 \left[
48 \begin{array}{c}
49 1 \ 1 \ 1 \ \dots \ 1 \\
50 x_1 \ x_2 \ x_3 \ \dots \ x_n \\
51 x_1^2 \ x_2^2 \ x_3^2 \ \dots \ x_n^2 \\
52 \vdots \ \vdots \ \vdots \ \ddots \ \vdots \\
53 x_1^{n-1} \ x_2^{n-1} \ x_3^{n-1} \ \dots \ x_n^{n-1}
54 \end{array}
55 \right].
56 \]
57 We call  $V_n$  the Vandermonde matrix of order  $n$ .
58 Claim:
59 \[
60 \det V_n = \prod_{1 \leq i < j \leq n} (x_j - x_i).
61 \]
62 \end{frame}
63
64 \begin{frame}{Q4. Make the following equations.}
65 \begin{itemize}
66 \item  $3^3+4^3+5^3=6^3$ 
67 \item  $\sqrt{100}=10$ 
68 \item  $(a+b)^3=a^3+3ab^2+3a^2b+b^3$ 
69 \item  $\sum_{k=1}^n k = \frac{n(n+1)}{2}$ 
70 \item  $\frac{d}{dx} \pi^4 = \frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \dots$ 
71 \end{itemize}
72 \end{frame}
73
74
75 \begin{frame}{Remaining parts of question 4}
76 \begin{itemize}
77 \item  $\theta = \sin(90^\circ - \theta)$ 
78 \item  $e^{i\theta} = \cos\theta + i\sin\theta$ 
79 \item  $\lim_{\theta \rightarrow 0} \frac{\sin\theta}{\theta} = 1$ 
80 \item  $\lim_{x \rightarrow \infty} \frac{\ln(x)}{x} = 0$ 
81 \item  $\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$ 
82 \end{itemize}
83 \end{frame}
84 \begin{frame}{Q 5. Typeset the following sentences.}
85 \begin{itemize}
86 \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  $c+a > b$ .
87 \item The area of a triangle with side lengths  $a, b, c$  is given by Heron's formula:

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88 $$ \textbf{A} = \sqrt{s(s-a)(s-b)(s-c)},, $$
89 where s is the semiperimeter (a+b+c)/2.
90 \item The volume of a regular tetrahedron of edge length 1 is  $\sqrt{2}/125$ .
91 \end{itemize}
92 \end{frame}
93 \begin{frame}{Remaining parts of question 5}
94 \begin{itemize}
95 \item The quadratic equation  $ax^2+bx+c=0$  has roots\
96  $r_1, r_2 = \frac{-b \pm \sqrt{b^2+4ac}}{2a}$ 
97
98 \item The derivative of a function f, denoted by  $f'$ , is defined by\
99  $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h)-f(x)}{h}$ 
100
101 \item A real-valued function f is convex on an interval I if\
102  $f(\lambda x + (1-\lambda)y) \leq \lambda f(x) + (1-\lambda)f(y)$ ,
103 for all  $x, y \in I$ , and,  $0 \leq \lambda \leq 1$ .
104 \end{itemize}
105 \end{frame}
106 \begin{frame}{Remaining parts of question 5}
107 \begin{itemize}
108 \item The general solution to the differential equation
109  $y-3y+2y=0$ 
110 is\
111  $y=C_1e^x+C_2e^{2x}$ 
112 \item The Fermat number  $F_n$  is defined as
113  $F_n=2^{2^n} + 1$ ,
114 \end{itemize}
115 \end{frame}
116 \begin{frame}{Q6. Make the following equations. Notice the large delimiters.}
117 \begin{itemize}
118 \item  $\frac{d}{dx} \left( \frac{x}{x+1} \right) = \frac{1}{(x+1)^2}$ 
119 \item  $\lim_{n \rightarrow \infty} \left( 1 + \frac{1}{n} \right)^n = e$ 
120 \item \begin{array}{cc}
121 a & & b \\
122 c & & d \end{array}
123 \end{array} \right) = ad-bc
124 \item  $R_{\theta} = \begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix}$ 
125 \end{itemize}
126 \end{frame}
127 \end{frame}
128 \end{frame}
129 \begin{frame}{Remaining parts of question 6}
130 \begin{itemize}
131 \item \begin{array}{ccc}
132 i & j & k \\
133 a_1 & a_2 & a_3 \\
134 b_1 & b_2 & b_3 \end{array}
135 \end{array} \right) = \begin{array}{cc}
136 a_1 & a_3 \\
137 b_1 & b_3 \end{array}
138 \item \begin{array}{cc}
139 a_1 & a_3 \\
140 b_2 & b_3 \end{array}
141 \end{array} \right) \textbf{i} = \begin{array}{cc}
142 a_1 & a_3 \\
143 b_1 & b_3 \end{array}
144 \item \begin{array}{cc}
145 a_1 & a_2 \\
146 b_1 & b_2 \end{array}
147 \end{array} \right) \textbf{k}
148
149 \item \begin{array}{cc}
150 a_{11} & a_{12} \\
151 a_{21} & a_{22} \end{array}
152 \end{array} \right) \begin{array}{cc}
153 b_{11} & b_{12} \\
154 b_{21} & b_{22} \end{array}
155 \end{array} \right) = \begin{array}{cc}
156 a_{11}b_{11}+a_{12}b_{21} & a_{11}b_{12}+a_{12}b_{22} \\
157 a_{21}b_{11}+a_{22}b_{21} & a_{21}b_{12}+a_{22}b_{22} \end{array}
158 \end{array}
159
160
161 \item  $f(x) = \begin{cases} -x^2, & x < 0 \\ x^2, & 0 \leq x \leq 2 \\ 4, & x > 0 \end{cases}$ 
162 \end{itemize}
163 \end{frame}
164 \end{frame}
165 \end{frame}
166 \begin{frame}{Q7. Make the following multi-line equations.}
167 \begin{itemize}
168 \item \begin{array}{r}
169 1+2 = 3 \\
170 4+5+6 = 7+8 \\
171 9+10+11+12 = 13+14+15 \end{array}
172 \end{itemize}
173 \end{frame}

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175     16+17+18+19+20& =& 21+22+23+24 \\\
176     25+26+27+28+29+30 &=& 31+32+33+34+35
177 \end{array} \]
178 \end{itemize}
179 \end{frame}
180
181 \begin{frame}{Q7. Part-2}
182 \begin{itemize}
183 \item \[\begin{array}{ccl}
184 (a+b)^2 & =& (a+b)(a+b) \\\
185 & =& (a+b)a+(a+b)b \\\
186 & =& a(a+b)+b(a+b) \\\
187 & =& a^2+ab+ba+b^2 \\\
188 & =& a^2+ab+ab+b^2 \\\
189 & =& a^2+2ab+b^2 \\\
190 \end{array}\]
191 \end{itemize}
192 \end{frame}
193 \begin{frame}{Q7. Part-3}
194 \begin{itemize}
195 \item \begin{eqnarray*} \tan(\alpha+\beta+\gamma) &=& \frac{\tan(\alpha+\beta)+\tan\gamma}{1-\tan(\alpha+\beta)\tan\gamma} \\
196 &=& \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} \\
197 &=& \frac{\tan\alpha+\tan\beta+(1-\tan\alpha\tan\beta)\tan\gamma}{1-\tan\alpha\tan\beta-(\tan\alpha+\tan\beta)\tan\gamma} \\
198 &=& \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} \\
199 \end{eqnarray*}
200 \end{itemize}
201 \end{frame}
202 \end{frame}
203
204 \begin{frame}{Q7. Part-4}
205 \begin{itemize}
206 \item \begin{eqnarray*}
207 \prod_p \left(1-\frac{1}{p^2}\right) &=& \prod_p \frac{1}{1+\frac{1}{p^2}+\frac{1}{p^4}+\cdots} \\
208 &=& \left(\prod_p \left(1+\frac{1}{p^2}+\frac{1}{p^4}+\cdots\right)\right)^{-1} \\
209 &=& \left(1+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\cdots\right)^{-1} \\
210 &=& \frac{6}{\pi^2} \\
211 \end{eqnarray*}
212 \end{itemize}
213 \end{frame}
214 \begin{frame}
215 \includegraphics[angle=30,height=9cm,width=11cm]{img9.jpg}
216 \end{frame}
217 \end{document}

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