





4MM013 - Computational Mathematics

Final Examination

University ID : 2227486

Submitted by : Nayan Raj Khanal

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1	$2x_1 + x_2 - x_3 = 0$
	$\chi_1 + \chi_2 = 4$
	$x_1 + x_2 + x_3 = 0$
	Now, writing the following set of equations in matrix form,
	2 1 -1 [x,] [0]
	1 0 1 1 = 4
	1 1 1 [x ₃] [0]
	Now 10 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	D = 2 1 -1
	1 0 1
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	= 2 0 1 - 1 1 1 - 1 1 0
	= -2 -0 -1
	= -3
	: Welle, -3 #0
	· Nx. = 0 1 -1
	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
	0 1 1
	= 0 0 1 -1 4 1 -1 4 0
	1 1 0 1 0 1
	= 0-4-4
	= - 8

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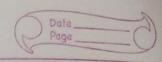
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	$\Delta x_{1} = 2.0 - 1$
	1 4 1
	1 0 1
	= 2 41 -0 11 -1 14
	01 11 10
193, V. 3	= 8-0+4
0	= 12
	0 12 1 2 2
	$\Delta x_3 = 2 \cdot 1 \cdot 0$
	104
	1 1 0
	= 2 0 4 - 1 1 4 + 0 1
	IT OL IT
	= -8+4+0
	= -4
	Finally,
	$\chi_1 = \Delta x_1 \Rightarrow -8 \Rightarrow 8$ $\Delta -3 3$
	$x_2 = \Delta x_2 \Rightarrow 12 \Rightarrow -4$ $\Delta = -3 = -3$
	$\frac{\chi_3 = \chi_3}{\Lambda} \Rightarrow \frac{-4}{3} \Rightarrow \frac{4}{3}$
	$\frac{\chi_3 = \chi_3 \Rightarrow -4 \Rightarrow 4}{\Delta -3 3}$

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$(2.0) x_1 + x_2 + x_3 = 2$	is to rulebe out with the
$2x_1 + 3x_2 + 4x_3 = 3$	
$x_1 - 2x_2 - x_3 = 1$	The state of the s
	$V = -(V_2) \otimes V \otimes V$
Now writing the following	sets of equations in matrix form,
1 1 1 2	Sex la ada alt pation
2 3 4 3	
1 -2 -1 1	- 10x + 0x 10 15
$R_2 \rightarrow R_2 - 2R_1$	2 - 1 - 1 - 1
1 1 1 2	
0 1 2 -1	almeta
1 -2 -1 1 1	
$k_3 \rightarrow k_3 - k_1$	
1 1 1 2	
0 1 2 -1	
0 -3 -2 -4	
$R_3 \rightarrow R_3 + 3R_2$	
1 1 1 2	
0 1 2 -1	
004-4]	
Hence, we can write,	$x_1 + x_2 = 2 \rightarrow 0$
4,7	$x_1 + 2x_2 = -1 \rightarrow \textcircled{2}$
	$\begin{array}{c} x_2 + x_3 = 2 \longrightarrow 0 \\ x_2 + 2x_3 = -1 \longrightarrow 2 \\ y_3 = -4 \longrightarrow 3 \end{array}$ $\begin{array}{c} x_2 + x_3 = 2 \longrightarrow 0 \\ x_2 + 2x_3 = -1 \longrightarrow 2 \end{array}$
	: x2 = -1

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Putting the value of x_3 in	eq Q, we get
$x_2 + 2x_3 = -1$ $x_2 + 2(-1) = -1$	
$\chi_{2}=1$	allot allo green see well
Putting the value of x3 & x2	in eq D, we get
$x_1 + x_2 + x_3 = 1$ $x_1 + 1 - 1 = 2$	30-14-1
$\chi_1 = \lambda$	
Finally,	
$x_1 = 2$ $x_2 = \frac{1}{2}$	14-19-13
	1 2 2 2 1
	1 2 2 2 2
	1-12 1 U

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b) Now to find the inverse of	the matrix,
Writing in matrix form,	F- 14 0 0 1
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	- 150 0 0 1 - 100 0 1 0 - 1 1 0 0
1 1 1 1 0 0 7 0 1 2 -2 1 0 1 -2 -1 0 0 1	p\3 0 0 1 0
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	HAR TONE OFF S
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	

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+	1	1	0 1	11/4	-3/4	-14	-
+	10	1	0	3/2	-1/2	-1/2	1
1	10	0	4	-7	3	1	1
1		1	2, ->	RI-K	22		

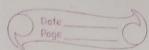
1	1	0	0	5/4	- /4	1/4	1
	0	1	0	312	-1/2	-1/2	1
	0	0	4	1-7	3	1	
		0		R3/1			

							-
1	1	0	0	5/4	-/4	1/4	
	0	١	0	3/2	- 1/2	-1/2	
	0	0	١	-7/4	314	1/4	-

.. The inverse of the matrix is

$$A^{-1} = \begin{bmatrix} 5/4 & -4/4 & 1/4 \\ 3/2 & -1/2 & -1/2 \\ -7/4 & 3/4 & 1/4 \end{bmatrix}$$

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3.	$t_n = (-1)^{n+1}$ $n+1$
	n^2+3
	$a_n = n + 1$
	n^2+3
	A colored in the manufactured and the colored
	$\lim_{n \to \infty} a_n = \lim_{n \to \infty} n + 1$
1, 8	$n \rightarrow \infty$ $n \rightarrow \infty$ $n^2 + 3$
	$\frac{1}{1} = \lim_{n \to \infty} x \left(1 + \frac{1}{n} \right)$
	7-300
	$= \lim_{n \to \infty} \left(1 + \frac{1}{n} \right)$
	$N \rightarrow \infty \left(n + \frac{3}{N} \right)$
	= 1 + 1/2
	$\omega + 3/\omega$
	= 1 1 (0)4
	. 0
	= 0
	Hence, the series converges.
	Fience,

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4.	Maclaurin series expansion of Sinx,
	$\int (x) = \sin x$
	For Maclaurin Series expansion,
	L+A MILED MILED
	$\frac{1}{3!} (x) = \frac{1}{3!} (0) + \frac{1}{3!} (0) x + \frac{1}{3!} (0) \frac{x^2}{4!} + \frac{1}{5!} (0) \frac{x^5}{5!} + \frac{1}{5!} (0) \frac{x^5}{5$
	$L(x) = \sin x \qquad L(0) = 0$
	$\int_{0}^{1} (x) = (\cos x)$ $\int_{0}^{1} (0) = 1$
	$ (x) = -\sin x$ $ (0) = 0$
	$\int_{0}^{\infty} (x) = -\cos x$ $\int_{0}^{\infty} (0) = -1$
	$\int_{0}^{\infty} (x) = \sin x \qquad \int_{0}^{\infty} (0) = 0$
	$\int_{0}^{\infty} (x) = \cos x \qquad \int_{0}^{\infty} (0) = 1$
	Now
	x = x + x
	$f(x) = f(0) + f'(0)x + f''(0)\frac{x^2}{2!} + f'''(0)\frac{3^2}{3!} + f''(0)\frac{x^4}{4!} + f'(0)\frac{x^5}{5!}$
	$= 0 + x + 0 - x^{3} + 0 + x^{5}$ $= \sum_{n \ge 0} (-1)^{n} = x^{2n+1}$ $(2n+1)!$
	31 51
	$=\sum_{n=0}^{\infty}\left(-1\right)^{n-2n}x^{2n+1}$
	n=0 (2n+1)!

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Now, calculating the radius of convergence using the ratio test,
$\Rightarrow \lim_{n \to \infty} \frac{a_n + 1}{a_n}$
$\Rightarrow \lim_{n \to \infty} \frac{\chi^2(n+1)}{\{2(n+1)+1\}!}$
$\frac{\chi^{2n}}{(2n+1)!}$
$\Rightarrow \lim_{n \to \infty} \frac{x^{2n+2}}{(2n+3)!}$ x^{2n+2}
(2n+1)1;
$\Rightarrow \lim_{n \to \infty} \frac{x^{2n+2}}{(2n+3)!} \times \frac{(2n+1)!}{x^{2n}}$
$\Rightarrow \lim_{n\to\infty} \frac{x^2}{(2n+3)!(2n+2)!}$
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