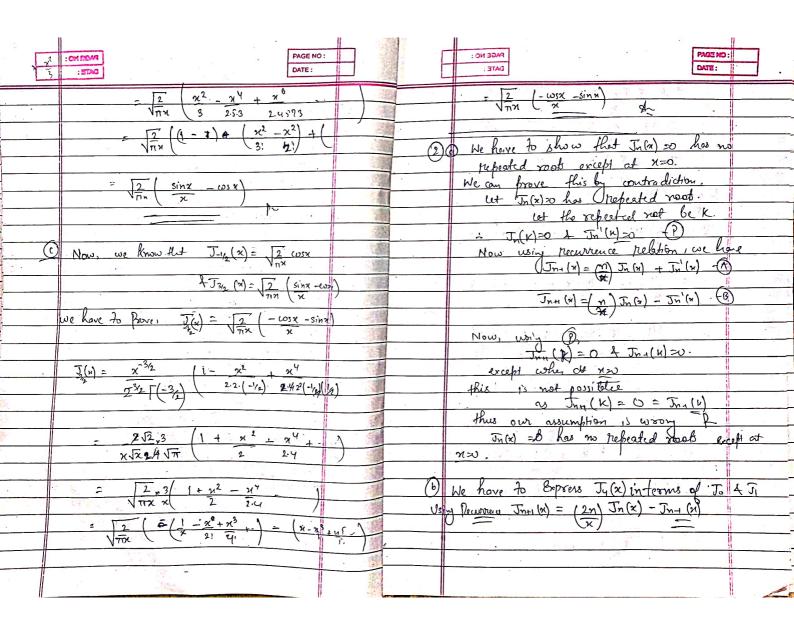
SOLUTION  MATHEMATICAL  METHODS  ANSWERS  DATE:  SOLUTION  METHODS  ANSWERS  DOT:  From  We know that $J_n(x) = x^n$ $J_n(x$		IEST NAME: ALTA NAME: ALTA PAGE NO:	AHTMAD:	PAGE NO:
[Answers]  (D)  (D)  (D)  (D)  (D)  (D)  (D)  (D		MATHEMATICAL		: STAG
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		[ANGMERG]		A SALE OF THE PROPERTY OF THE
$ \frac{J_{n}(x) = x^{n}}{2^{n} \Gamma(nx)} = \frac{1-x^{2} + x^{4}}{2 \cdot 2 \cdot (nx)} \frac{1-x^{2} + x^{4}}{2 \cdot 4 \cdot 2 \cdot (nx) \cdot (nx)} $ $ \frac{N_{000}}{1 \cdot 1 \cdot 1 \cdot 2} = J_{-1}(x) $ $ = \frac{x^{1/2}}{2^{1/2}} \Gamma(\frac{1}{2}) = \frac{1-x^{2}}{2 \cdot 1 \cdot 2 \cdot $		(WEATER)	(I	) (a) To' Prove: J-1, (x)= 12
$ \frac{J_{n}(x) = x^{n}}{2^{n} \Gamma(nx)} = \frac{1-x^{2} + x^{4}}{2 \cdot 2 \cdot (nx)} \frac{1-x^{2} + x^{4}}{2 \cdot 4 \cdot 2 \cdot (nx) \cdot (nx)} $ $ \frac{N_{000}}{1 \cdot 1 \cdot 1 \cdot 2} = J_{-1}(x) $ $ = \frac{x^{1/2}}{2^{1/2}} \Gamma(\frac{1}{2}) = \frac{1-x^{2}}{2 \cdot 1 \cdot 2 \cdot $	(D)			Proof TIX
$ \frac{J_{n}(x) = x^{n}}{2^{n} \Gamma(nx)} = \frac{1-x^{2} + x^{4}}{2 \cdot 2 \cdot (nx)} \frac{1}{24 \cdot 2^{2} \cdot (nx) (nx)} $ $ \frac{N_{040}}{2^{1/2}} \frac{LHS}{2} = J_{-1}(x) $ $ = \frac{x^{1/2}}{2^{1/2}} \frac{1-x^{2} + x^{4}}{1-x^{2}} \frac{1}{2^{4}x^{2}} \frac{1}{2^{4}$				We know that
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				$J_n(x) = x^n \qquad \lceil 1 - x^2 + x^4 \rceil$
Now, LHS = $\overline{J_{-1}}_{2}(x)$ $= \frac{x^{1/2}}{2^{1/2}} \Gamma(\frac{1}{2}) \frac{1 - x^{2} + x^{4}}{2^{2}(x)} \frac{1 - x^{2} + x^{4}}{x^{4}}$ $= \frac{4}{2} \frac{1 - x^{2} + x^{4}}{1 - x^{2} + x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{2}} \frac{1 - x^{2} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4} + x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4}}{x^{4}} \frac{x^{4}}{x^{4}} \frac{x^{4}}{x^{4}}$ $= \frac{2}{1 + x^{4}} \frac{1 - x^{4}}{x^{4}} \frac{x^{4}}{x^{4}} \frac{x^{4}}{x^{4$				2" T (n+1) 2.2 (n+1) 2.4.2 (n+1) (n+2)
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$= \sqrt{\frac{2}{11}} \left( \frac{1-x^2+x^4-x^6}{2!} - \frac{x^6}{4!} - \frac{x^6}{6!} \right)$ $= \sqrt{\frac{2}{11}} \left( \cos x \right) = RHS$ $= \sqrt{\frac{2}{11}} \left( \cos x \right) = \sqrt{\frac{2}{11}} \left( \frac{\sin x - \cos x}{x} \right)$ $= \sqrt{\frac{2}{11}} \left( \frac{\sin x - \cos x}{x} \right)$ $= \sqrt{\frac{2}{11}} \left( \frac{\cos x}{x} \right)$ $= \sqrt{\frac{2}{11}} \left( $				
$= \sqrt{\frac{2}{11}} \left( \frac{1-x^2+x^4-x^6}{2!} - \frac{x^6}{4!} - \frac{x^6}{6!} \right)$ $= \sqrt{\frac{2}{11}} \left( \cos x \right) = RHS$ $= \sqrt{\frac{2}{11}} \left( \cos x \right) = \sqrt{\frac{2}{11}} \left( \frac{\sin x - \cos x}{x} \right)$ $= \sqrt{\frac{2}{11}} \left( \frac{\sin x - \cos x}{x} \right)$ $= \sqrt{\frac{2}{11}} \left( \frac{\cos x}{x} \right)$ $= \sqrt{\frac{2}{11}} \left( $				$= 4\sqrt{2} / 1 - x^2 + x^4 + x^6$
$ \frac{1}{\sqrt{\pi x}} $				V TT × 2 1.2.3.4 1.2.3.45.6
$ \frac{1}{\sqrt{\pi x}} $			1000	
$ \frac{2}{110} \cos x = RHP $ $ \frac{1}{110} \cos x = RHP $ $\frac{1}{110} \cos x = RHP$ $\frac$			163016	$= \sqrt{2} \left( 1 - x^2 + x^4 - x^6 - x^$
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			1000	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$				$= \sqrt{2 \cos x} = RHS$
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$				Vinx the be
Frost We have $J_{21}(n) = \frac{\chi^{3/2}}{2^{3/2} \cdot \lceil (3/2) \rceil} = \frac{\chi^{2} \cdot 2}{2 \cdot 2 \cdot (3/2)} = \frac{\chi^{2}}{2 \cdot 2 \cdot (3/2)} = \chi^$				
Frost We have $J_{21}(n) = \frac{\chi^{3/2}}{2^{3/2} \cdot \lceil (3/2) \rceil} = \frac{\chi^{2}}{2 \cdot 2 \cdot \lceil (3/2) \rceil} = \frac{\chi^{2}}{2 \cdot$				b) 10 Krove: $U_{3/2}(\alpha) = \frac{2}{\sqrt{\pi \alpha}} \frac{\sin \alpha - \cos \alpha}{\alpha}$
		-		TO A SECOND PROPERTY OF THE PR
			<u> </u>	We have J21/4 = 20 - 24/57
$= \frac{x^{3/2} / 2}{2 \cdot \sqrt{17}} \left( \frac{1 - x^2}{2 \cdot 5} + \frac{1}{2} \right)$	10			The state of the s
ZT2. JTT 2.5	11.4		100	x3/2 /2 ( 1 - x2 + x4
				\$\frac{12}{2}\sqrt{17}  \frac{2-5}{2}\sqrt{10}
				A STATE OF THE STA



	: CM EDM9 : NTAC) PAGE NO: DATE:		CATE:	
C HOTO	$\overline{J_4(x)} = 2x3 \overline{J_3(x)} - \overline{J_1(x)} - \overline{(1)}$		> Jay = - (net) Jnot + Jn	The state of the s
	~	i de		
	$J_3(x) = \underbrace{2x_2 \ J_2(x) - J_1(x) \cdot (1)}_{\infty}$		$d\left[J_{n}^{2}+J_{nH}^{2}\right]=2J_{n}J_{n}^{2}+2J_{nH}J_{nH}$	n in the Later of
			on In Take	
	$J_2(x) = 2 J_1(x) - J_0(x) (-11)$		= 2Jn (n Jn - Jn+1)	
10	Using (), (ii) & (iii), we have,	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	+ 2 Jn+1 (- (m+1) Jn+1	+7%\
	Osing (7,11) fews, use move,	7	/ / / / / / / / / / / / / / / / / / / /	1-)
	TW = 6 [4 [250] FW = TW = 15	Γσ	$= 2\left(\frac{m}{\pi} \operatorname{Jn}^2 - \frac{(n+1)}{\pi} \operatorname{Jn}_{+}^2\right)$	
Dan I	$\overline{J_{\nu}(x)} = \frac{6}{x} \left[ \frac{4}{x} \left( \frac{2J_{\nu}(x)}{x} - J_{\nu}(x) \right) - J_{\nu}(x) - \frac{2J_{\nu}}{x} \right]$		a a	17,81
11			Now, if nº1,2,	
	$= \frac{24 \times 27}{3} - \frac{247}{3} - \frac{67}{3} - \frac{21}{3} + \frac{1}{3}$		$\frac{d \left[ J_{0}^{2} + J_{1}^{*} \right] = 2 \left( 0 - J_{1}^{2} \right)}{J_{1}}$	
	$\chi^2$ $\chi$ $\chi^2$ $\chi$			¥0.
	<u> </u>		$\frac{d}{dM} \left[ \widetilde{J}_1^2 + \widetilde{J}_2^2 \right] = 2 \left( \widetilde{J}_1 + 2\widetilde{J}_1^2 \right).$	
	$= \begin{bmatrix} 48 & -8 \\ x^3 & \overline{x} \end{bmatrix} J_1(x) + \begin{pmatrix} 1-24 \\ 0 \end{pmatrix} J_2(x)$	28.20 20.00		76
	(x3 x) -	17.60	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
<u>.</u>	To Prover Jo2+ 2 (J12+J22+J32+)=1			
(3)4	1 15 (10VE) 38 1 2 (9 1 32 1/3 That) - 1		Addes up we go	
	We know the generation faint of Fu (on).		Adder up we god  9 ( J. 2 + 2 ( J ( + J 2 2 + ) ) = 0	
			B. T. W. M. F.	
	500, t/= 01/t-/t) 2/ July 44		12 Jo'+ 2 (J12+ J22+) = K.	1975
	у :		at x=0 J=J2==0	
	From the recurrence, relation were, we	la	↓ J₀ =	100
1	$J_n' = (-n)J_n + J_{n-1}$		$\frac{1}{2} \frac{J_0^2 + 2(\overline{J_0^2 + 32^2 + \dots - 3})}{J_0^2 + 2(\overline{J_0^2 + 32^2 + \dots - 3})} = 1$	
G. St.	$\overline{J_n} = \left(\frac{n}{x}\right)\overline{J_n} - \overline{J_{n+1}}$		J <sub>0</sub> -12(3)+32+3) = 1	
2000 Acres 1	2 On - 1 Mil			
262 Te 1/2				
			5 25	

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(b) From Bray part, we have			3 x(1-x) diy + y' + 2y =0
(b) From Brev. part, we have Jo2 to (J12+J2+ ) = 1.			U
as In 2(n) >0 + nc IN.		4	Now, comparing it to the hypergeometric for
			U N
-: 2 (3/2+522+) >0	K I		x(1-x) y" + (Y + - (x+ p+1) x) y" - ABy = 0
* Jo2+2(J?+J,2+) 2, Jo2			we have.
3 56 41		- ;	$V = V_{ij}$ ; $\alpha + \beta + 1 = 0$ , $\alpha \beta = -2$ . $\beta = -1 - \alpha \Rightarrow -\alpha (1 + \alpha) = ^{-2}$
D (36° ≤ 1			p= -1-0( +) -0(1+0)=-2
١٤   ١٥			d <sup>1</sup> + d - 2 > 0
they provid Tool ()			(a+2)(d-1)=0
		,	Ø=1,-2
( Fo Prove:   Jn(x)   < 2 - 1/2 4n>	21		$\beta = -2$ , $\gamma$
			if d=1, p=-2
We know To'+2(JP+J12+)=1 ⇒ 2(Jm2) ≤1		-	y = 8,2 F <sub>1</sub> (α,β; Y; x)+ & x <sup>1-Y</sup> 2F <sub>1</sub> (α+1-Y,β+1-Y; 2-Y,x)
$\Rightarrow 2(J_m^2) \leq 1$			8 4- 01 T. (1-211: x)+(2) x342 F (7 -5. 7 x)
(: 5) J <sub>1</sub> > 0)			# y= (c) 2F1 (1,-2,1/1) x) +(C2) x3/4 2F1 (7,-5, 7, 1x)  y= (4) (1-8x+ 32x) + C2 x3/2, F1(4F-1, 7, 1) y  Here, G+G are arbitrary constants
			Here. GAG are arbitrary constants
$0 \qquad (\overline{J_n}^2) \leq 2^{-1}$			
p tin2 = 2-1	(A)		The second secon
JA < 2-12		6	lim 2Fi (a,b; \( \frac{1}{2} \); \( \chi^2 \)
	15		lim $_{2}F_{1}\left(\alpha,b;\frac{1}{2};x^{2}\right)$ $\alpha,b\rightarrow\infty$ $_{3}F_{1}\left(\alpha,\beta;Y,x\right)=\sum_{n=0}^{\infty}\frac{(\alpha)n(\beta)n}{(Y)}\frac{x^{n}}{n!}$
thus [Jn] 5.21/2 from			$F_{n}(\alpha,\beta;Y;x) = \sum_{n} (\alpha)n(\beta)n x^{n}$
=	. 36		9co (y)n 9c'
O O Lietu Valle and 2 - 2 - i.b.	250		
(4) (6) 48(1-x) y"+ y'+ 8y =0 about n 20 The given DF can be writte as			> 2F1 (0, b, 1/2, x²) = 51, (a) n (b) n (x²) n. 1
The given DF can be writte is	2.34		40b) pero (2)n (40b) qu
-	(1)	1960 g	T T T T T T T T T T T T T T T T T T T
			La contraction of the second

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	= lina 1+ at x2 + x(a+1) (b)(b+1) + x4	<del>-</del>	re, Ai = - Ai' or Ai = - Ai
	U1000 1.1/2 400 1.2.1.3 VX 47 14	1	2 II JIK
			Apg = - Adi ,
	$= \lim_{0 \to \infty} 1 + 2x^2 + (a+1)(b+1)x^4 + \dots$		de la
	0.hx & 2 24 ab		it is skew-symmetric in it is
t.	4.11 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		
	$= \lim_{\alpha \in \mathbb{R}^{n}} \left( \frac{1+1}{a} \right) \left( \frac{1+1}{b} \right) \frac{xy}{2y} + \cdots$	• • •	if Ai is a 2nd order controvariant tensor-
	/24	,	that has 14 component in the space VN
*	= (1+ x2, x4, x6, )		then the components are
74.2 78	$= \frac{1 + x^2 + x^4 + x^6}{2 \cdot x^7} + \frac{x^6}{2} + \frac{x^7}{2} + x^$		A11 A12 A15 MIN  A21 A12 A23 A2N
N.	= cosh (21)		A21 A12 A23 A2N
·			ANI ANZ - Ann
6	A tensor is called symmetric with suspect to		Non of it is clear symmetry
	2 contravariant or 2 covariant indices if it		Now if it is skew symmetra the dragonal clements are 0.
	I components geniain unchanged whom the whooler		for the other elements, we an define
			as Ai = -Ais
12	AU = AU for controvering		as Air = - Ais
	If a tensor is symmetric work trespect to any 2		: thus the total number of independs
25.7	Ait Aisk = Adia		componers D N(N-1)
T)	If a tensor is symmetric with respect to any 2		2
	contravariant & cry two covariant indices it	0	as was a long banks of the
	is called 'synthetric'.		Chrosstoffel symbol on brocket of 1st 4
-	A tensor is called skew symmetric with greept	_	(i : k] ~ 1 ( 29 ) 29 kg - 89 kg
84	to 2 contra variat or 2 covoliant . If there is		$\frac{(i,j,k) = \frac{1}{2} \left( \frac{\partial J_{ix}}{\partial x_{i}} + \frac{\partial J_{ix}}{\partial x_{i}^{2}} + \frac{\partial J_{ix}}{\partial x_{i}^{2}} \right)}{\frac{\partial x_{i}^{2}}{\partial x_{i}^{2}} + \frac{\partial J_{ix}}{\partial x_{i}^{2}}}$
5.7	to Land var al of Land at a free B		28 5 ( = glx [is, n]
	a rigative sign when we charge the inchis		* E fix = o to
.			<u> </u>
- 11			

PAGE NO : PAGE NO: DATE: it is another symbol for i'i'l These are not tousdes have fil = the [ij, k] Now for each element, we can define finner multiplicat gren by

flm [2] = flm ( [20; 4] = ( m [23 k) = [13, h] 8m Amm AK) · Now, we have to defermine the number of independent components of the Christoffel Symbals. i for a metric fensor we there are n(noi) independent composes Jis this to each independent compound flux i by symmetr Hure are nº1n n2 (n+1) number ef Choistoffel by subole which live ridep, compo