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	AI61003 Linear Algebra for AI & ML
1,114.	AI61003 Linear Algebra for AT & ML Assignment of-Problem of
(-)	
(a)	Define addition operation \+': Pn(R) x Pn(R) → Pn(R)
er dan V	TIPU(IK) X PN (IK) F) PN (IK)
9,7	Define scalar multiplication operation 1.1: R x Pn (R) → Pn (R)
	··· : (K X FU CIK)
	Pulk) is a well westow coase because
	Pn(R) is a meal vectou space because the following properties are satisfied.
	roce journing properties are sairs, ress.
(n)	y b, b, € Pn(R) (b1+b2) € Pn(R)
	y ρ, ρ₂ ∈ Pn(R) (ρ₁+ρ₂) ∈ Pn(R) (-: addition of two polynomials is also a polynomial)
	also a polynomial)
(2)	∀ p, p2 ∈ Pn(R), (p,+p2) = (p2+p1) (: addition on polynomials is commutative)
	(: addition on polynomials is
	commutative)
(3)	
	(p, + p2) + p3 (: addition on polynom-
	- ials is associative).
<u> </u>	Faunque po Epn(R) s.t. po+p=
	p+po=p v p E IN (IK)
<u> </u>	V b e lu (R) 7 a unique b e lu (R)
(5)	
	11-15 (-10) vii=0 Then choose
	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
1	H b & P. (R) Y K C R (L L) & P. (R)
6	K. h = k & d. x = \$ (k d.) x & & Pn(R)
	1=0 1=0 1=0

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a la	
(1)	1. Ξ \angle
4	1. $\leq \alpha \cdot \chi^{i} = \leq (1. \langle i \rangle \chi^{i}) = \leq (\langle \alpha^{i} \rangle \chi^{i})$
9	$\forall (x, \beta) \in \mathbb{R}^2 \beta \in Pu(\mathbb{R})$
	$(\alpha\beta) p = \alpha (\beta b) n$
	$(\alpha \beta) \stackrel{>}{=} t \cdot \chi^i = \alpha \stackrel{>}{=} (\beta t \cdot) \chi^i = \alpha (\beta b)$
(9)	Y(X,B) ER2 be Pn(R)
عميدة في	(x+B)b = xb+Bb
, don	$(\alpha + \beta) \stackrel{\mathcal{L}}{=} t_i \chi_i^i = \stackrel{\mathcal{L}}{=} (\alpha + \beta) t_i^i \chi_i^i$
	i=0 i=0
The CARL	$= \sum (xt; x^i + \beta ti x^i)$
2.	Lileon was to not the to
	n o o o
	$= \sum_{i=0}^{N} (xti) x^{i} + \sum_{i=0}^{N} (\beta t_{i}) x^{i} = \lambda \beta + \beta \beta$
(10)	V b, b, E Pn (IR) V KER
	$k(p_1+p_2)_{\underline{M}} = kp_1 + kp_2$
Auto Operation	$b_1 + b_2 = \sum_{i=0}^{\infty} \langle \chi^i + \sum_{i=0}^{\infty} \beta_i y^i \rangle$
A-	N
	$= \underbrace{\sum \left(\underbrace{\lambda_{i} \chi_{i} + \beta_{i} y_{i}} \right)}_{i=0}$
	$k(p_1+p_2) = k \geq (xix^{i} + \betaiy^{i})$
	. /. 12 - / 1 (8 - 1 . 1 . 20. 1)
	$k(p_1+p_2)=\sum_{i=0}^{\infty}(kx_ix_i+ky_iy_i)$
19 7 4e	111 1 5 /1 10 7 1
	$k(p_1 + p_2) = \sum_{i=0}^{\infty} (kx_i)x + \sum_{i=0}^{\infty} (kp_i)y_i$
	$k(b_1+b_2) = kb_1 + kb_2$

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(6)	F is a linear functional because the
	F is a linear functional because the following properties are satisfied.
to a service of	
0	Additivity Consider p, q e Pn(IR)
	Consider p q e Pn(IR)
	n x o
	Let $p = \sum_{i=0}^{n} x_i x_i$, $q = \sum_{i=0}^{n} \beta_i x_i$
	1 1 - 5 1 - 1 - 1
	$\frac{d}{dx} = \sum_{i=1}^{\infty} x_i x_i^{i-1}$
+ A 1 7 -	$A = \sum_{i=1}^{N} Q_{i} X_{i}$
	$\frac{dx}{dx} = \sum_{i=1}^{N} \beta_i i x^{i-1}$
	The work But a Line of the contract of the con
	$\mathcal{F}(p_{x}+q_{x})=d(p_{x}+q_{x})$
= \ \	x = 0
	$= \left(\frac{d p_{x} + d q_{x}}{d x} \right) _{x=0}$
	(ax ax x=0
	$= \left(\begin{array}{c} 1 \\ 1 \\ 1 \end{array} \right) \left(\begin{array}{c} 1 \end{array} \right) \left(\begin{array}{c} 1 \\ 1 \end{array} \right) \left(\begin{array}{c} 1 \end{array} \right) \left(\begin{array}{c} 1 \\ 1 \end{array} \right) \left(\begin{array}{c} 1 \end{array} \right) \left(\begin{array}{c} 1 \\ 1 \end{array} \right) \left(\begin{array}{c} 1 \end{array}$
	$\frac{\partial x}{\partial x} = 0 \left(\frac{\partial x}{\partial x} \right) = 0$
	$= F(p_x) + F(q_x)$
	Hence proved.
\$.4.	
2	Homogeneity
	Consider px EPn(R) (defined in
	the same way) and I & IR
	$(\Lambda P_X) = \alpha (\Lambda P_X)$
	dx 12=0
	* Apply chain rule

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	$= \left[b d (\lambda) + \lambda d (b_{\bullet}) \right]$
	$= \left[\frac{P_{x} \cdot d_{x}}{d_{x}} \right] + \frac{A_{x} \cdot d_{x}}{d_{x}} \right] = 0$
	$= \lambda d (bx) \qquad (:: \lambda \text{ is constt.})$
	dx $x=0$
	$= \lambda \mathcal{F}(P_X)_M$
	Hence proved.
(6)	1 0 1 1 0 0 1 0 0 0 1 1 0 0 0 0 0 0 0 0
(C)	Any polynomial b & Pn(1R) can be
	Any polynomial $b \in Pn(IR)$ can be represented by $b_c \in R^{n+1}$ where b_c is the vector of coefficients in b .
	pe is the occion of confit a cours of.
	If $p = \sum_{i=0}^{\infty} \lambda_i x^i$, then
	i=0 ; + x 4) = (
	b = R N+1 s.t. e b = 2 \forall k=
	As already stated. d b = \(\xi \text{3c}^{i-1} \)
	∂x $i=1$
	(a) (b) (b) (b) (c) (d) (d)
	$\frac{dX}{dx} = 0$
	$= \sum_{i=1}^{n} \frac{1}{i} = \sum_{i=1}^{n} \frac{1}{i$
	So the linear functional F has the
	to llowing representation
\checkmark	F(b) = e2 b where e2 b 6 R
	1x (n+1)
	Precisely e = [0 1 0 0 0 0]

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