Dimension If fu, vz, ..., vn is a basis for a V.S. V over a field F, then dimension of V denoted by dim(v) is n. Theorem Let dim(V) = n. Then (i) If S= {v, v2, -, vn} is a not of linearly independent vectors of V then S is a basis for V. (ii) If J= {v,,v2,-,v,} spans V, then S is a basis for V. Proof Outline S= fu,ve,-,un) Suppose Spon(s) & V. ", w, w, v,, vz, - · · · ~ } LI. Sis a Basis (ii)



Theorem Let J= {v,v, -, vn} be a basis for a V.J. V over a find F. If w= d,v,+d2V2+...+ dnvn and w= B,v, + B2v2 + - + B,v

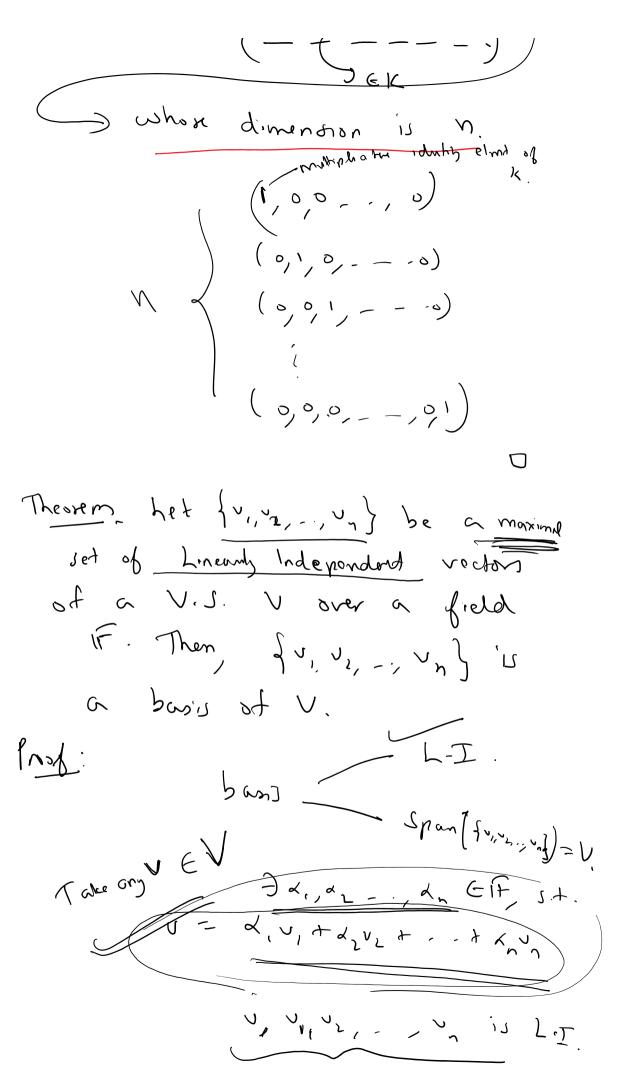
then $\forall i \in (n)$ $\alpha_i = \beta_i$.

Prof: Suppin not.

(D - (E)

 $= (\langle A, -\beta_1 \rangle) V_1 + --$ + (dn-12) un

Proposition Let K be a field. Then, K" over K is a V.S.



Theorem Let Lu, uz Jung is a minimal set of vectors trad spans a rector space V over a field 5 wis 1/8 V. Homogeneous system of Linear Egry Recall that MAT (K) 15 a V.S. MAN (Over K. asis below to a field of field $a_{11}x_{1} + a_{12}x_{2} + \cdots + a_{1n}x_{n} = 0$

and the and the and a homogeneous yellow of L.E. has a mon-trivial solution if m< n.

recor m démensional ne know from Superpose ~ dim(Fm) = m. When n>m, s={A', A', -, n'} is in IF over IF.) That is, they are hin Depen That means, there is a non-timing linear Combinchen of A' A? -- A frat yields the O vector. Inner Product ix = 1.

Intro to Lin algebra contd Page 5

Inner Product $u = (u, u_2, ..., u_n) \in \mathbb{R}^n$ V 2 (V, NL, -, Vn) G 12 M Dot product u.v = u,v, + u,v, + --+ u,v, Dot product is a special type of inner product. het V be a V.J. over a field K. An inner product or V is a mapping which maps any pair of rectors you in V to a scalar. It is denoted by <u, w) It satisfies the following properties <191) ζυ,ω) = ζω,υ) (IPZ) Lav, w) = d (v, w) and Luxw) - a Luw) When & EK. (183) \(\nu, \nu, \nu, \nu) = \(\nu, \nu) +

Fisher Inequality

() 1940s

Ronald Fisher

Theorem: het k,n be two pooline integer with $k \le n$. Let F be a family of subject of [n] such that for every distinct A, B \in F, we have $|A \cap B| = k$. Then, $|F| \le n$.

Sexample.

 $F = \left\{ \frac{1}{3}, \frac{1}{1}, \frac{2}{3}, \frac{1}{3}, \frac{1$

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Fisher k=1,

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