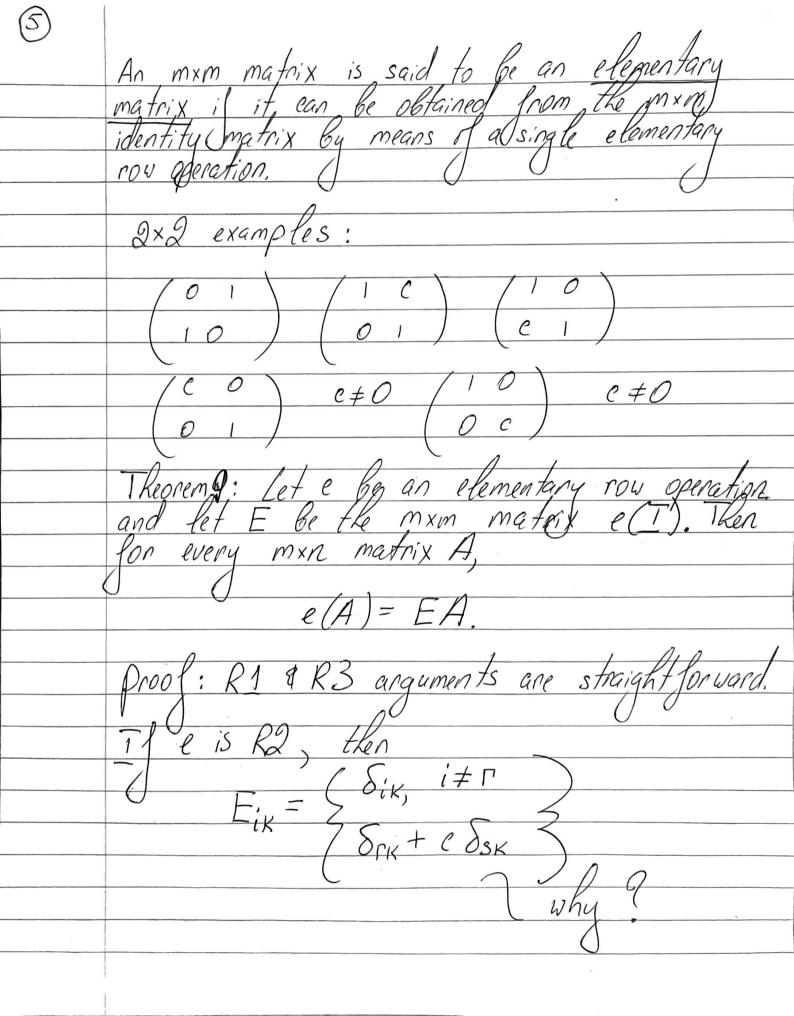


Long view: why multiply matrices?

Let A = mx n matrix, X = (x) transforms X 17 as a function from K-tuples of elements of F K by m matrix over F AX) can be viewed as a be viewed as a function we will explore this point of view in defail later.

(3)	Some notation:
<del>y _</del>	
	Il B is an NXP matrix the columns
	If B is an NxP matrix, the eolumns
	$\Lambda$
	are 1/x 1 matrices B1, B2,, Bp, defined
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
	$B_{nj}$ $  \leq j \leq p$ .
	Then B = [B1, B2, ,, Bp].
	Applying the definition of multiplication,
	if A is an mxn matrix,
	$AB = [AB_1, AB_2,, AB_p].$
	The all Mullialization of matrices is not
	Example: Multiplication of matrices is not
	/1-1/0 1 /1-1 (ON MU JOSTIVE.
	(01)(-12)=(-12)
	At not
	(0 1 /1-1) = (0 1) necessarily
	(-12)(01)-(-13)
7	

Theorem 8: If A,B,C are matrices over F >
BC and A(BC) are well-defined, then so are the products AB, (AB)C and A(BC) = (AB)Cassociativity Proof: Suppose that B is an Axp matrix. Since BC is defined, C is a matrix w/prows, and BC Ras n nows. Because A(BC) is defined, so we may assume that A is an Mxn matrix. Thus A.B exists and is an mxp matrix, so (AB) C exists. Now we prove that A(BC)=(AB)C  $[A(BC)]_{ij} = \sum_{r} A_{ir} (BC)_{rj} = \sum_{r} A_{ir} \sum_{s} B_{rs} C_{sj}$ =  $\sum_{s} A_{ip} B_{ps} C_{ss} = \sum_{s} A_{ip} B_{ps} C_{ss}$  $= \sum_{s} \left( \sum_{r} A_{ir} B_{rs} \right) C_{s;} = \sum_{s} (AB)_{is} C_{s;} = \left[ (AB) C_{j;} \right]$ 



Tt follows that M EA 2 (SIK + C SSK) AKi = Ar; + e Asi It follows that EA = e(A). Corollary: A, B mxn matrices over F. Then B is now-equivalent to A iff B = PA, where P = PA where P = PA where P = PA where P = PA is PA = PA where PA = PA is PA = PA is PA = PA where PA = PA is PA = PA is PA = PA where PA = PA is PA = PA is PA = PA is PA = PA where PA = PA is PA =Proof: Suppose that B=PA, P= E\_8 E\_3..., E, Them B is rog-equivalent to A by a finite inductive chain argument using Theorem 9. Conversely, if B is row-equivalent to A, let E, E, Es cornespond to now operations live, le, les