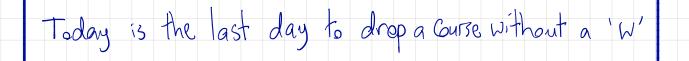


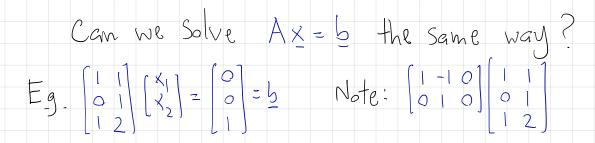
Next: § 4.1: Vector Spaces & Subspaces

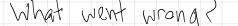


Homework:

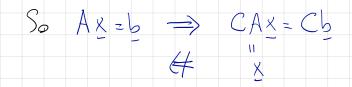
MATLAB Assignent #3: Due Feb 9 (next Friday) My Mathlab Homework #4: Due Feb

## Back to gradeschool algébra: Solve ax = b for x.





What went wrong? System  $A \times = b$ . C = s.t. CA = In



New, suppose AC = Im.

 $\begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1$ 

Definition: Let A be an n×n matrix. It is called

invertible if there is a matrix C satisfying

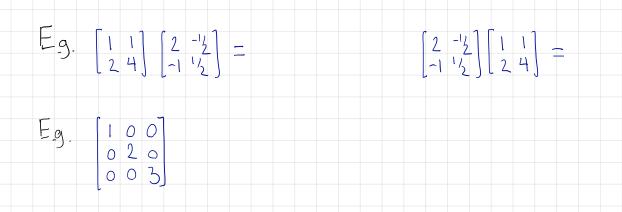
Then we denote

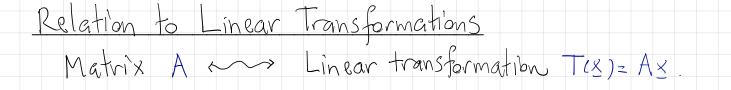
Solving Systems: Ax= b \* Existence:

\* Uniqueness:

Invertible matrices must be square. AA-1 = I: \* If AX=b is solvable for any b.

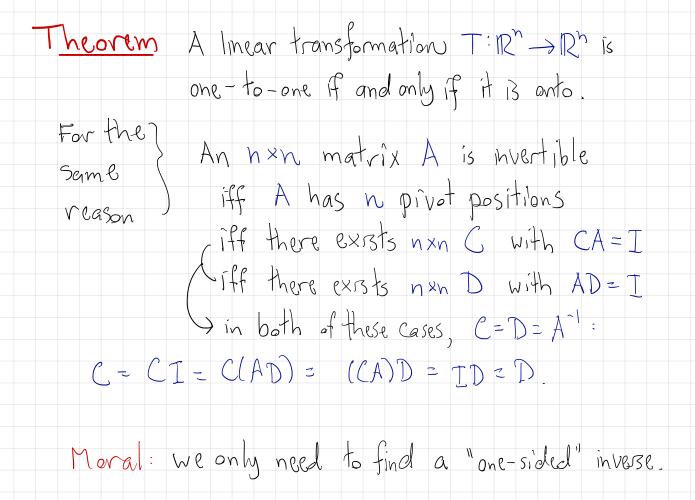
A'A=I: \* If Ax=b has a unique solution whenever it is Gonsistent,



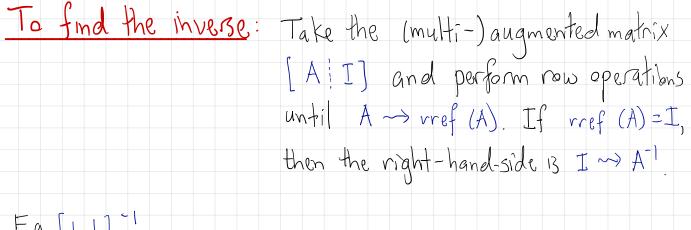


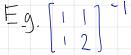
- \* Ax=b solvable for all b (=> T is onto
- \* Ax= b has at most one solution for each b => T is one-to-one

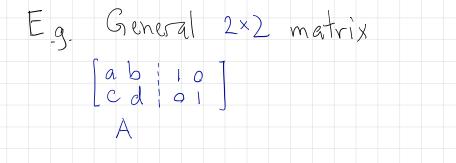
A'A=I ~> T onte ~> every row is pivotal. AA'=I ~> T is one-to-one ~> every column is pivotal. for a square matrix, every row is prootal iff every column is pivotal!



## Not all square matrices are invertible! (Must have maximal pivots.) Q: How do we find the inverse, if it exists?

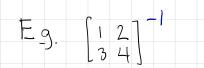


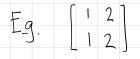




Theorem: A is invertible iff

and in this case





Recap: A matrix A is invertible if there is a matrix C with CA = I = AC. We denote C = A<sup>-1</sup> in this case. \* Only square matrices can be invertible À is invertible if and only if rref (A) = I \* T.e. every now of A is privetal ie. every column of A is privotal is. The Clumns of A are linearly independent and span IR?. \* To find A', we use now reduction:  $\left[\begin{array}{c} A & I \\ \end{array}\right] \xrightarrow{RREF} \left[\begin{array}{c} I & A^{-I} \\ \end{array}\right]$