Today: § 4.2-4.3: Bases of GI(A), Nul(A)

& § 4.5-4.6: Dimension & Rank

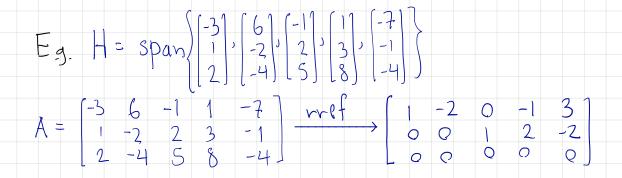
Next: §4.4&4.7: Change of Basis

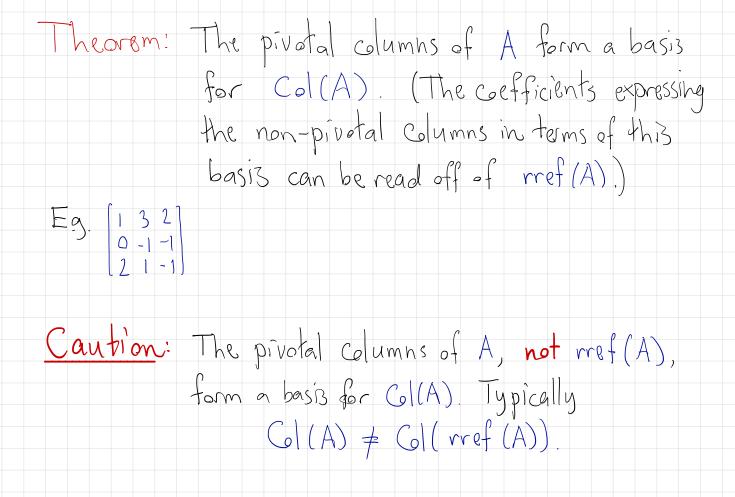
Homework: My MathLab Homework #4: Due IONHEHT by 11:59pm My MathLab Homework #5: Due Feb 20 by 11:59pm

A basis of a subspace H is a collection of vectors { V1, V2, ..., Vd} CH that (1) spans 17, and (2) is linearly independent. Subspaces are frequently presented as the span of some collection of vectors; but those vectors may not be independent. How do we find a basis?

 $H = span \left\{ \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ -1 \end{bmatrix} \right\}$

Corallary: If H = span { y1,..., yn}, then some collection of these vectors is a basis for H.

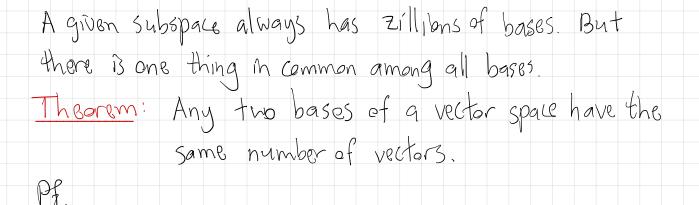


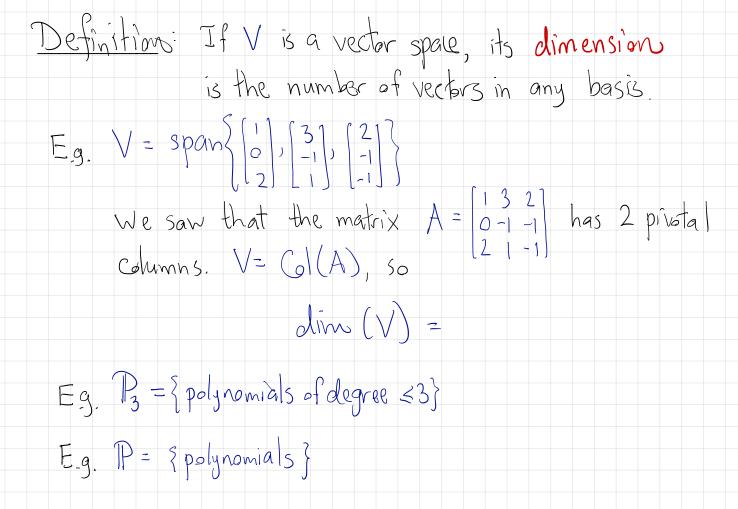


How about Nul(A)? How do I find a basis?

 $A = \begin{bmatrix} -3 & 6 & -1 & 1 & -7 \\ 1 & -2 & 2 & 3 & -1 \\ 2 & -4 & 5 & 8 & -4 \end{bmatrix} \xrightarrow{\text{rref}} \begin{bmatrix} 1 & -2 & 0 & -1 & 3 \\ 0 & 0 & 1 & 2 & -2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

Theorem: This J procedure for identifying Nul(A) always produces a basis for it.





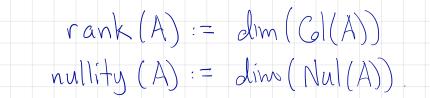
Theorem: If { yi, ..., yn} is linearly independent, it can be extended to form a basis: $\{\underline{V}_{1}, \underline{\cdots}, \underline{V}_{n}, \underline{U}_{1}, \underline{\cdots}, \underline{U}_{p}\}$ If {wi,--, wh} is a spanning set,

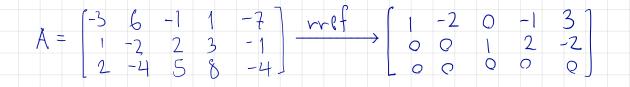
it can be reduced to form a basis.

Corollary: If H is a subspace of V, then

 $dim(H) \leq dim(V)$.

Definition: Given a matrix A,





Rank Theorem: If A is an mxn matrix,

rank(A) + nullity(A) = n (= # Glumns of A)