Today §5.1: Eigenvalues

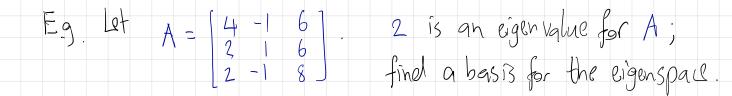
& §5.2: Characteristic Polynomial

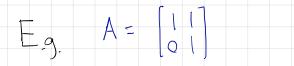
Next: Review for Midtern 2

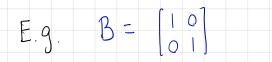
Reminders: My MathLab Homework #6: Due TOMORRow by 11:59pn Midterm #2: This Wednesday 8-10pm Room/seat assgn. & practice midterms posted on Gurse webpage. Given an nxn matrix A, an eigenvector is a nonzero vector $y \in \mathbb{R}^n$ with the property that $Ay = \lambda y$

For some scalar LEIR, called the eigenvalue.

- The set of eigenvectors of A for a given eigenvalue λ
 is equal to Nul(A-λI). So it is a subspace
 of R^{*}, called the eigenspace for λ. The
 eigenvectors are the nonzero vectors in the eigenspace.
- Typically hard to find the eigenvalues of a matrix;
 once known, finding the eigenspace is routine.



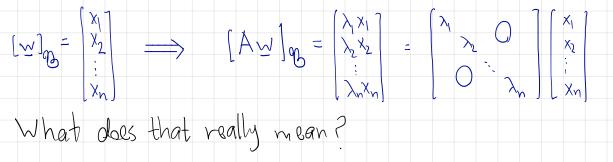




Theorem. Eigenvectors with distinct eigenvalues are linearly independent.

Corollary: If A is an nxn matrix with n distinct

eigenvalues, then there is a basis of Rⁿ Consisting of eigenvectors of A.



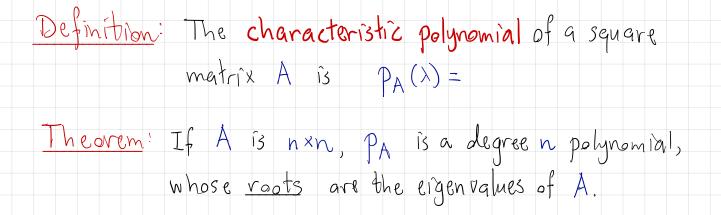
 $Definition: n \times n$ matrices A and B are called similar if there is an invertible n \times n matrix P with the property $A = PBP^{-1}$

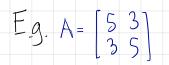
- We just saw that, if A has all distinct eigenvalues,
 then it is similar to a diagonal matrix. That's important;
 more on that next time.
- · Similarity is not the same as row equivalent.

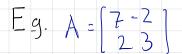
Eg. $A = \begin{bmatrix} 1 \\ 0 \end{bmatrix} B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ row equivalent, but not similar.

Theorem: If A and B are similar, then they have the same eigenvalues; and the eigenspaces for A have the same dimensions as the eigenspaces for B.

How can we actually find the eigenvalues?







Eg. $A = \begin{bmatrix} 5 & -2 & 3 \\ 0 & 1 & 0 \\ 6 & 7 & -2 \end{bmatrix}$