Midterm #1

FRI, 2/26

exam: 8:00 – 8:55 AM upload work by 9:30 AM

PDF

format

- check it out ! — link in email
- show-your-work problems — ~ 2
- short answer problems — ~ 10
  - no "real" work needed

practice

- review HW
- practice problems + solutions

tools

- calculators allowed — but: show work
- notes allowed — but: watch time

Questions ?

- Lots of review
  - Gaussian elimination, null spaces, determinants, eigenstuff, ...
- LU decomposition (not on exam)
- diagonalization

THEME: orthogonality

- fundamental theorem
  - col(A) and null(A^T) are orthogonal complements
- consistency of linear systems
- least squares solutions
  - application: least squares lines (linear regression)
  - application: data fitting
- orthogonal projections
  - projection matrices
  - using orthogonal bases
- Gram-Schmidt + QR
- orthogonal matrices
- diagonalizability
- spectral theorem

EG $A \rightsquigarrow$ RREF B

$\text{null}(A) = \text{null}(B)$

solutions to $Ax = 0$

$$B = \begin{bmatrix} 1 & 4 & 0 & 7 & 0 \\ 0 & 0 & 1 & -2 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

x_2 free, x_4 free

$$x_1 + 4x_2 + 7x_4 = 0$$
$$x_3 - 2x_4 = 0$$
$$x_5 = 0$$

$Ax = 0$

general solution to $Bx = 0$:

$$\begin{bmatrix} -4x_2 - 7x_4 \\ x_2 \\ 2x_4 \\ x_4 \\ 0 \end{bmatrix} = x_2 \begin{bmatrix} -4 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix} + x_4 \begin{bmatrix} -7 \\ 0 \\ 2 \\ 1 \\ 0 \end{bmatrix}$$

basis for null (A)