

MIDTERM 2 MATH 210 (FALL 2013)

Name:

Problem 1: Find the inverse of $A = \begin{bmatrix} 1 & -1 & -2 \\ 2 & -3 & -5 \\ -1 & 3 & 5 \end{bmatrix}$ and use it to solve $A\mathbf{x} = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}$.

Problem 2: **Problem 2:** a) Let $A = \begin{bmatrix} 1 & 0 & 1 & 2 & 1 \\ 0 & 1 & -1 & -3 & 1 \\ 1 & 1 & 0 & -1 & 1 \\ 0 & 1 & -1 & -3 & 1 \end{bmatrix}$.

- a) Find bases for the column space, row space and nullspace of A .
- b) Write all the possible bases for the column space of A using only columns of A .

Problem 3: Find a basis for each of the following 3 subspaces:

a) The subspace of vectors (b_1, b_2, b_3, b_4) in $\mathbf{R}^4$ satisfying $b_1 = b_2$ and $b_4 = 2b_2$.

b) The subspace consisting of all vectors $\mathbf{b}$ for which the system $\begin{bmatrix} 1 & 1 & 0 \\ 1 & 2 & 0 \\ 1 & 0 & 0 \end{bmatrix} \mathbf{x} = \mathbf{b}$ is solvable.

c) The subspace of all symmetric 2×2 matrices (it is a subspace of the vector space of all 2×2 matrices).

Problem 4: a) Using the cofactor formula find the determinant of

$$A = \begin{bmatrix} 2 & 0 & 4 & -1 \\ 1 & -2 & 0 & 0 \\ 3 & 1 & 0 & 0 \\ 0 & 4 & -2 & 0 \end{bmatrix}$$

b) What would be the determinant of the matrix B which is equal to A except in the 3rd column, the 3rd column of B is equal to the the sum of all the columns of A ?

Problem 5: Let $A = \begin{bmatrix} 2 & 3 \\ \frac{-1}{2} & \frac{-1}{2} \end{bmatrix}$.

a) Find the eigenvalues of A .

b) Find the eigenspaces of A .

b) Find $\lim_{k \rightarrow \infty} A^k \begin{bmatrix} -1 \\ 1 \end{bmatrix}$.