Math 22A

## Practice questions for the 2/16 midterm

1. (a) Define 
$$A = \begin{pmatrix} 1 & 3 & -1 \\ 1 & 4 & -1 \\ -1 & -3 & 2 \end{pmatrix}$$
. Compute the inverse matrix of  $A$ .  
(b) Find the solution  $v = \begin{pmatrix} x \\ y \\ z \end{pmatrix}$  to the equation  $Av = \begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix}$ .

**2.** Compute the following determinants:

(a) 
$$\det \begin{pmatrix} 1 & 2 \\ 3 & k \end{pmatrix}$$
 (c)  $\det \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 4 & -2 \\ 0 & 0 & 3 & 1 & 0 \end{pmatrix}$ 

(b) det 
$$\begin{pmatrix} 1 & 0 & 2 \\ 0 & 4 & -2 \\ 3 & 1 & 0 \end{pmatrix}$$
 (d) det $(A^3)$  where  $A = \begin{pmatrix} 2 & 0 & 0 \\ 13 & 2 & 0 \\ -19 & 1001 & -1 \end{pmatrix}$ 

**3.** Let  $\sigma$  be the permutation  $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 3 & 1 & 6 & 5 & 4 \end{pmatrix}$  of order 6.

- (a) Find the sign  $sgn(\sigma)$  of the permutation. Explain your answer a guess with no explanation is not a valid answer.
- (b) Find the inverse permutation  $\sigma^{-1}$ .
- 4. Let M be a  $4 \times 4$  matrix. Let N be the matrix obtained from M by performing the following sequence of elementary row operations:
  - 1. Swap rows 2, 3.
  - 2. Multiply row 2 by 2.
  - 3. Add row 2 to row 1.
  - (a) If det(M) = 5, find det(N).
  - (b) Find a  $4 \times 4$  matrix A such that N = AM.

**5.** Let  $L : \mathbb{R}^2 \to \mathbb{R}^2$  be a linear transformation given by L(v) = Av, where  $A = \begin{pmatrix} -10 & -6 \\ 18 & 11 \end{pmatrix}$ . Find the two eigenvalues  $\lambda_1, \lambda_2$  of A and for each eigenvector find an associated eigenvector.