

Math 240
Linear Algebra
Homework 2

1. Find the inverse of each matrix.

$$(a) A = \begin{bmatrix} 5 & 8 \\ -8 & 7 \end{bmatrix}$$

$$(b) B = \begin{bmatrix} 2 - 2i & -5 - 2i \\ 1 & -1 - 2i \end{bmatrix}$$

$$(c) C = \begin{bmatrix} -4 & 12 & 35 \\ 1 & -4 & -12 \\ -1 & 3 & 9 \end{bmatrix}$$

$$(d) D = \begin{bmatrix} 1 & -4 & 5 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

2. Find all values of k for which the matrix

$$A = \begin{bmatrix} 2 & -7 \\ 5 & k \end{bmatrix}$$

is invertible.

3. Find the determinant for each matrix.

$$(a) A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

$$(b) B = \begin{bmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{bmatrix}$$

$$(c) C = \begin{bmatrix} 2 & 2 & -9 \\ 0 & 1 & -2 \\ 0 & 0 & 5 \end{bmatrix}$$

$$(d) D = \begin{bmatrix} -1 & 0 & 0 & 0 \\ 6 & 2 & 0 & 0 \\ 1 & -1 & -1 & 0 \\ 8 & 9 & 1 & -3 \end{bmatrix}$$

$$(e) E = \begin{bmatrix} 1 & 0 & 0 & -1 & 0 \\ -1 & 0 & 3 & 0 & 0 \\ 0 & -3 & 0 & 0 & 2 \\ 0 & 0 & 0 & 2 & 2 \\ 0 & 1 & -3 & 0 & 0 \end{bmatrix}$$

$$(f) F = \begin{bmatrix} 2 & -5 \\ -11 & -8 \end{bmatrix}$$

4. Suppose that A and B are 4×4 matrices, where $\det(A) = 1$ and $\det(B) = 8$. Find

(a) $\det(AB)$ (b) $\det(2A)$ (c) $\det(A^\top)$ (d) $\det(B^{-1})$ (e) $\det(B^5)$

5. If

$$A = \begin{bmatrix} -3e^{3t} & 3e^{4t} \\ 2e^{3t} & 3e^{4t} \end{bmatrix}$$

then find

(a) $\det(A)$

(b) $\text{adj}(A)$

(c) A^{-1}

(d) C : the matrix of cofactors.

6. Use the adjoint of the matrix to find the inverse for each matrix.

(a) $A = \begin{bmatrix} -2 & 3 & 2 \\ 6 & 0 & 3 \\ 4 & 1 & 1 \end{bmatrix}$

(b) $B = \begin{bmatrix} \cos \theta & 0 & -\sin \theta \\ 0 & 1 & 0 \\ \sin \theta & 0 & \cos \theta \end{bmatrix}$

7. Solve using Cramer's Rule.

(a)
$$\begin{cases} 6x_1 - 3x_2 = 39 \\ 5x_1 + 9x_2 = -25 \end{cases}$$

(b)
$$\begin{cases} -x_1 + 2x_2 + 7x_3 = 13 \\ 2x_1 - x_2 - 2x_3 = -2 \\ 3x_1 + 5x_2 + 2x_3 = -14 \end{cases}$$

8. Find all values of λ for which $\det(A) = 0$.

(a) $A = \begin{bmatrix} \lambda - 4 & 1 \\ -5 & \lambda + 4 \end{bmatrix}$

(b) $A = \begin{bmatrix} \lambda - 4 & 0 & 0 \\ 0 & \lambda & 2 \\ 0 & 3 & \lambda - 3 \end{bmatrix}$