Student: Huseyin Kerem Mican **Date:** 7/1/21	**Instructor:** Taylan Sengul **Course:** Linear Algebra	**Assignment:** Section 3.2 Homework

1. Find the determinant by row reduction to echelon form.

$$\begin{vmatrix} 1 & 5 & -7 \\ -1 & -4 & -5 \\ 2 & 8 & 7 \end{vmatrix}$$

Use row operations to reduce the matrix to echelon form.

$$\begin{bmatrix} 1 & 5 & -7 \\ -1 & -4 & -5 \\ 2 & 8 & 7 \end{bmatrix} \sim \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Find the determinant of the given matrix.

$$\begin{vmatrix} 1 & 5 & -7 \\ -1 & -4 & -5 \\ 2 & 8 & 7 \end{vmatrix} = \quad -3 \quad$$ (Simplify your answer.)

2. Find the determinant by row reduction to echelon form.

$$\begin{vmatrix} 1 & -1 & -3 & 0 \\ 7 & -6 & 3 & 2 \\ 1 & 3 & -2 & 3 \\ -3 & 7 & 10 & 3 \end{vmatrix}$$

Use row operations to reduce the matrix to echelon form.

$$\begin{bmatrix} 1 & -1 & -3 & 0 \\ 7 & -6 & 3 & 2 \\ 1 & 3 & -2 & 3 \\ -3 & 7 & 10 & 3 \end{bmatrix} \sim \begin{bmatrix} 1 & 0 & 0 & \frac{17}{19} \\ 0 & 1 & 0 & \frac{14}{19} \\ 0 & 0 & 1 & \frac{1}{19} \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Find the determinant of the given matrix.

$$\begin{vmatrix} 1 & -1 & -3 & 0 \\ 7 & -6 & 3 & 2 \\ 1 & 3 & -2 & 3 \\ -3 & 7 & 10 & 3 \end{vmatrix} = \quad 0 \quad$$ (Simplify your answer.)

3. Find the determinant by row reduction to echelon form.

$$\begin{vmatrix} 1 & -3 & 1 & 0 & -6 \\ 0 & 2 & -2 & 9 & 2 \\ -2 & 6 & -2 & 2 & 4 \\ 1 & -5 & 4 & 1 & 6 \\ 0 & 2 & -2 & 11 & 4 \end{vmatrix}$$

Use row operations to reduce the matrix to echelon form.

$$\begin{bmatrix} 1 & -3 & 1 & 0 & -6 \\ 0 & 2 & -2 & 9 & 2 \\ -2 & 6 & -2 & 2 & 4 \\ 1 & -5 & 4 & 1 & 6 \\ 0 & 2 & -2 & 11 & 4 \end{bmatrix} \sim \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

Find the determinant of the given matrix.

$$\begin{vmatrix} 1 & -3 & 1 & 0 & -6 \\ 0 & 2 & -2 & 9 & 2 \\ -2 & 6 & -2 & 2 & 4 \\ 1 & -5 & 4 & 1 & 6 \\ 0 & 2 & -2 & 11 & 4 \end{vmatrix} = \boxed{-40}$$ (Simplify your answer.)

4. Combine the methods of row reduction and cofactor expansion to compute the determinant.

$$\begin{vmatrix} -1 & 2 & 6 & 0 \\ 3 & 3 & 5 & 0 \\ 7 & 6 & 8 & 6 \\ 5 & 3 & 5 & 3 \end{vmatrix}$$

The determinant is $\boxed{126}$.
(Simplify your answer.)

5. Combine the methods of row reduction and cofactor expansion to compute the determinant.

$$\begin{vmatrix} 1 & 5 & 4 & 1 \\ 0 & -4 & -8 & 0 \\ 3 & 5 & 4 & 1 \\ -6 & 4 & 4 & 0 \end{vmatrix}$$

The determinant is $\boxed{32}$.
(Simplify your answer.)

6. Find the determinant below, where $\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = 8$.

$$\begin{vmatrix} a & b & c \\ d & e & f \\ 7g & 7h & 7i \end{vmatrix}$$

$\begin{vmatrix} a & b & c \\ d & e & f \\ 7g & 7h & 7i \end{vmatrix} =$ 56 (Simplify your answer.)

7. If $\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = 3$, find $\begin{vmatrix} a & b & c \\ 6d+g & 6e+h & 6f+i \\ g & h & i \end{vmatrix}$.

$\begin{vmatrix} a & b & c \\ 6d+g & 6e+h & 6f+i \\ g & h & i \end{vmatrix} =$ 18 (Simplify your answer.)

8. Use determinants to find out if the matrix is invertible.

$$\begin{bmatrix} -5 & 0 & 1 \\ 1 & -3 & -2 \\ 0 & -5 & -3 \end{bmatrix}$$

The determinant of the matrix is 0. (Simplify your answer.)

Is the matrix invertible? Choose the correct answer below.

- The matrix is invertible.
- ✔ The matrix is not invertible.

9. Use determinants to find out if the matrix is invertible.

$$\begin{bmatrix} 1 & -1 & -2 & 0 \\ 0 & 1 & 5 & 4 \\ 3 & -1 & -3 & 4 \\ -1 & 2 & 7 & 5 \end{bmatrix}$$

The determinant of the matrix is -7. (Simplify your answer.)

Is the matrix invertible? Choose the correct answer below.

- ✔ **A.** The matrix is invertible.
- **B.** The matrix is not invertible.

10. Use determinants to decide if the set of vectors is linearly independent.

$$\begin{bmatrix} 4 \\ -7 \\ 1 \end{bmatrix}, \begin{bmatrix} -5 \\ 8 \\ 4 \end{bmatrix}, \begin{bmatrix} 4 \\ 0 \\ -8 \end{bmatrix}$$

The determinant of the matrix whose columns are the given vectors is -120. (Simplify your answer.)

Is the set of vectors linearly independent? Choose the correct answer below.

- **A.** The set of vectors is linearly dependent, because the determinant is not zero.
- **B.** The set of vectors is linearly independent, because the determinant is not zero.
- **C.** The set of vectors is linearly dependent, because the determinant exists.
- **D.** The set of vectors is linearly independent, because the determinant exists.

11. Compute $\det B^4$ where $B = \begin{bmatrix} 1 & 0 & 2 \\ 2 & 2 & 3 \\ 2 & 2 & 2 \end{bmatrix}$.

$\det B^4 =$ 16 (Simplify your answer.)

12. Verify that $\det AB = (\det A)(\det B)$, where the matrices A and B are given below.

$$A = \begin{bmatrix} 5 & 0 \\ 10 & 1 \end{bmatrix}, B = \begin{bmatrix} 3 & 0 \\ 5 & 6 \end{bmatrix}$$

Calculate det A and det B.

$\det A =$ 5, $\det B =$ 18 (Simplify your answers.)

Now calculate the product $(\det A)(\det B)$.

$(\det A)(\det B) =$ 90 (Simplify your answer.)

Calculate the product of matrices AB.

$AB = \begin{bmatrix} 15 & 0 \\ 35 & 6 \end{bmatrix}$ (Type an integer or decimal for each matrix element.)

Now calculate the determinant of the product of matrices A and B.

$\det (AB) =$ 90 (Simplify your answer.)

13. Let A and B be 3×3 matrices, with $\det A = 4$ and $\det B = 3$. Use properties of determinants to complete parts (a) through (e) below.

a. Compute $\det AB$.

$\det AB =$ 12 (Type an integer or a fraction.)

b. Compute $\det 5A$.

$\det 5A =$ 500 (Type an integer or a fraction.)

c. Compute $\det B^T$.

$\det B^T =$ 3 (Type an integer or a fraction.)

d. Compute $\det A^{-1}$.

$\det A^{-1} =$ $\frac{1}{4}$ (Type an integer or a simplified fraction.)

e. Compute $\det A^3$.

$\det A^3 =$ 64 (Type an integer or a fraction.)