

# Homework 4 and Study Problems - MATH 225

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In this document, you will find two types of problems: homework and study problems. You are required to submit **only the homework problems** to Gradescope. The study problems are intended to help you grasp the topics thoroughly and prepare for exams. It is strongly advised to attempt all study problems for a comprehensive understanding.

Please submit your homework to Gradescope until **February 11, 11pm**.

## Homework problems

1. Find the determinants of the following matrices **using row operations and properties of determinants**.

$$A = \begin{bmatrix} 3 & 7 & 1 \\ 5 & 9 & -6 \\ 2 & 1 & 3 \end{bmatrix} \qquad B = \begin{bmatrix} 2 & 1 & 3 & 5 \\ 3 & 0 & 1 & 2 \\ 4 & 1 & 4 & 3 \\ 5 & 2 & 5 & 3 \end{bmatrix}$$

2. Determine all values of the constant  $k$  for which the given system has an infinite number of solutions. **Use determinant approach**.

$$\begin{aligned} x + 2y + kz &= 0 \\ 2x - ky + z &= 0 \\ 3x + 6y + z &= 0 \end{aligned}$$

3. Let  $A$  and  $B$  be  $4 \times 4$  matrices such that  $\det(A) = 2$  and  $\det(B) = -6$ . Compute the determinant of the given matrices. Use the properties of determinant.

$$AB^T, \quad A^{-1}(5B), \quad B^2A^3, \quad (A^TB^{-1})^2, \quad B^{-1}(2A)B^T.$$

4. Compute the determinant of the following matrix using cofactor expansion. Pick the easiest row or column to use.

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

5. Use Cramer's rule to solve the given linear system.

$$\begin{aligned} 3x + y + 2z &= -1 \\ 2x - y + z &= -1 \\ 5y + 5z &= -5 \end{aligned}$$

## Study problems

1. True-False Reviews on pages 205, 206, 218, 231, and 232.
2. Sections from 3.1 to 3.4 contains lots of exercises, solve them to study determinants, its properties, cofactor expansion, and Cramer's rule.
3. Especially, I suggest exercises 3.2.29-36 to study the relationship between row/column operations and determinants.
4. I suggest exercises 3.3.39-49 to study adjoints, cofactors, inverses.
5. I suggest exercises in Section 3.5 since it includes all questions from previous sections in Chapter 3.