

Math 20 Fall 2003
Midterm 1 Review Sheet

Listed below are the tasks per section that you should be prepared to do on the midterm. The problems on the midterm will be similar to the homework problems previously assigned. For more practice, try the “additional exercises” for each section listed below.

§1.2 *Gaussian Elimination*

- Solve a system of linear equations using (a) Gaussian elimination and back-substitution or (b) Gauss-Jordan elimination
- Express the general solution of a system of linear equations with infinitely many solutions using one or more parameters
- *Additional Exercises: #8*

§1.3 *Matrices and Matrix Operations*

- Be familiar with basic matrix notation and terminology
- Perform the following operations on matrices
 - addition
 - subtraction
 - scalar multiplication
 - matrix multiplication
 - transposition
- *Additional Exercises: #3(a, b), 4, 5(a, b)*

§1.4 *Inverses and Rules of Matrix Arithmetic*

- Apply the properties of matrix arithmetic listed in Theorem 1.4.1
- Perform matrix arithmetic with zero and identity matrices
- Apply Theorem 1.4.5 to find the inverse of a 2×2 matrix
- Apply Theorem 1.4.6 to find the inverse of a product of two or more matrices
- Apply the laws of exponents listed in Theorems 1.4.7 and 1.4.8
- Apply the properties of the transpose listed in Theorems 1.4.9 and 1.4.10
- *Additional Exercises: #4*

§1.5 *Elementary Matrices and a Method for Finding A^{-1}*

- Represent a row operation applied to a given matrix as a multiplication by an appropriate elementary matrix (Theorem 1.5.1)
- Use the method given in §1.5 to find the inverse of a matrix or show that the matrix is not invertible
- *Additional Exercises: #4, 7*

§1.6 *Further Results on Systems of Equations and Invertibility*

- Solve a system of linear equations by matrix inversion (Theorem 1.6.2)

- *Additional Exercises: #1, 3, 5*

§2.1 *The Determinant Function*

- Determine whether a permutation is even or odd by counting its inversions
- Find the determinant of a matrix using the definition of the determinant (that is, using signed elementary products)
- *Additional Exercises: #2, 5, 7, 9, 11*

§2.2 *Evaluating Determinants by Row Reduction*

- Find the determinant of a matrix using the properties of determinants listed in Theorem 2.2.1, 2.2.2, 2.2.3, and 2.2.5
- Find the determinant of a matrix using row reduction techniques
- *Additional Exercises: #3, 5, 7, 9, 13*

§2.3 *Properties of the Determinant Function*

- Apply Theorem 2.3.4 to find the determinant of the product of two or more matrices
- Apply Theorem 2.3.5 to find the determinant of the inverse of a matrix
- Find the eigenvalues and eigenvectors of a matrix
- Know the statements of the Big Theorem thus far (Theorem 2.3.6)
- *Additional Exercises: #6, 12, 16*

§2.4 *Cofactor Expansion and Cramer's Rule*

- Find the minor and cofactor of an entry of a matrix
- Find the determinant of a matrix by cofactor expansion
- Find the adjoint of a matrix
- Find the inverse of a matrix using its adjoint
- Solve a system of linear equations using Cramer's Rule (Theorem 2.4.3)
- *Additional Exercises: #2(a, b), 5, 7, 9, 11, 17*

§11.6 *Markov Chains*

- Interpret the transition matrix of a Markov chain
- Apply Theorem 11.6.1 to find the future state vectors of a Markov chain given the transition matrix and an initial state vector
- Apply Theorem 11.6.4 to find the steady-state vector of a regular transition matrix
- *Additional Exercises: #2*

§11.8 *Games of Strategy*

- Interpret the payoff matrix and strategy vectors for a two-person zero-sum game
- Find the expected payoff of a two-person zero-sum game given its payoff matrix and each player's strategy
- Find the optimal strategies for the two players in a strictly determined two-person zero-sum game
- *Additional Exercises: #2*