

Math 225, Sections M1
Review Sheet for Midterm 2
March 30, 2009

1. Matrix Operations and Invertible Matrices. Know:

- how to add two matrices, how to multiply a matrix by a number (scalar), how to multiply two matrices, how to take the transpose of a matrix, and the properties of all these operations, see Section 2.1;
- the definition of an invertible matrix, see Section 2.2;
- how to use invertible matrices to solve systems of equations, see Theorem 5 in Section 2.2;
- how to compute the inverse of a matrix:
 - for a 2×2 matrix, see Theorem 4 in Section 2.2;
 - via row operations (row reduction), see Section 2.2;
 - using determinants, see Section 3.3;
- properties of the inverse of a matrix, see Theorem 6 in Section 2.2;
- how to characterize the invertibility of a square matrix A via:
 - linear independence of columns of A , or the number of solutions of $Ax = 0$, see Theorem 8 in Section 2.3;
 - consistency of $Ax = b$, or the span of columns of A , see Theorem 8 in Section 2.3;
 - the determinant of A , see Theorem 4 in Section 3.2.
 - the invertibility of the transpose of A , see Theorem 8 in Section 2.3.

2. Determinants. Know:

- the definition of the determinant of a 1×1 matrix, 2×2 matrix, larger matrices via cofactor expansions, see Sections 3.1;
- how a determinant changes after a row operation or when taking the transpose, or after multiplying two matrices, see Section 3.2;
- how to calculate determinants using row, column operations and cofactor expansions, in particular how to compute determinants of upper or lower triangular matrices;
- how to use determinants to:
 - establish whether a matrix is invertible, see Theorem 4 in Section 3.2;
 - solve linear system of equations using the Cramer rule, see Section 3.3;
 - calculate the inverse of a matrix, see Section 3.3;
 - calculate the area of a parallelogram or volumes of parallelepipeds, see Section 3.3;