Study Guide for Test 1

The test will be Wednesday, September 23, and will cover sections 1.2, 1.3, 1.4, 1.5, 2.1 and 2.2 as detailed below. It will be closed books and notes.

Please see me if you have any questions or if you would like some help.

1.2. Be able to solve systems of linear equations by using Gauss-Jordan elimination. (That is, use row operations to write the augmented matrix for the system in *reduced* row echelon form. I won't ask you to use Gaussian elimination, that is, reducing to triangular form and using back substitution.) Be able to handle inconsistent and dependent systems; for the latter, be able to solve for lead variables in terms of free variables, to write the solution in parametric form. I might give you a problem with an augmented matrix already in reduced row-echelon form, and ask you to give the solution in parametric form.

1.3. Be able to add and multiply matrices. Be able to find scalar products of matrices. Be able to find the transpose of a matrix.

1.4 and 1.5. Be able to find the inverse of a matrix by using row operations. (I might not ask you to use row operations to find an inverse matrix, particularly if the matrix is 2×2. In that case, you are free to use the little formula for the inverse of a 2×2 matrix.)

Be able to write a system of linear equations in the form $AX = B$, and be able to use A^{-1} to solve that system (so $X = A^{-1}B$).

Be able to write elementary matrices corresponding to given row operations.

2.1. Be able to find a determinant by expanding along a row or column.

Be able to find the matrix of minors and the matrix of cofactors for a 3×3 matrix. Be able to find the adjoint matrix for a 3×3 matrix.

Be able to find the inverse of a 3×3 matrix using the adjoint matrix (using the formula $A^{-1} = \frac{1}{\det A}\mathrm{adj}A$).

Be able to use Cramer's rule to solve a system of linear equations. I would give you a problem with two equations in two unknowns.

2.2. Be able to use row operations to find the determinant of a matrix.

Know what row operations (or elementary matrices) do to the determinant of a matrix. (If you interchange two rows, you multiply the determinant by -1; if multiply a row by k, you multiply the determinant by the same number; if you add a multiple of one row to another, the determinant is unchanged.)

Be able to recognize when it is easy to find the determinant of a matrix (a row of zeros; one row a multiple of another row; upper or lower triangular form).

Be able to determine whether a matrix is invertible by finding the determinant.

Be able to verify for given matrices that $\det(AB) = (\det A)(\det B)$.