

## MATH 211 MIDTERM REVIEW HIGHLIGHTS

### Systems of Linear Equations

- What it is, picture, solutions (unique and parametric), consistent and inconsistent.
- How to find these solutions, equivalent systems, elementary operations.
- Augmented (coefficient, constant) matrix, elementary row operations, (reduced) row-echelon form.
- Gauss-Jordan Elimination, Gaussian Elimination (ref and back substitution)
- Practice and practice, and then argue general patterns.
- Homogeneous systems, what they are and what it means for solutions.
- Linear combination, rank, and what they are for.

### Matrices

- Basic notions, size, rows, entries.
- Basic operations and properties: addition and subtractions, scalar multiplication, zero matrix,..
- Matrix multiplication: requirements, output, how, each entry, .. and (non) properties
- Transform a system of linear equation into its matrix form  $AX=B$ .
- Transpose, symmetric matrices, identity matrix.
- The inverse, what it is, why, how to get it, and properties.
- Matrix inverses and systems of linear equations, what it means.
- Elementary matrices, what they are, what they are for, inverse of elementary matrices,
- $R=E_k \dots E_2 E_1 A$ , product of elementary matrices.

### Determinants

- Basic notions... sign, minor and cofactor of each position.
- Cofactor expansion along any row or column (all yield the determinant)
- Practice and practice, and then handle general patterns.
- Determinant of special matrices, (lower / upper) triangular matrices...
- Elementary row operations and determinant, computing determinant using this, ..
- Determinant and inverses, determinant of matrix products, transpose, ..
- Adjugate, adjugate formula, Cramer's rule, polynomial interpolation.