

# FINAL REVIEW MATH 211

## (Winter 2017)

### Main Tools: (All Important)

- System of Linear equations (elementary operations, rref, elementary matrices, ..)
- Matrices (Algebra, multiplication, inverses, properties)
- Determinant (How to compute and use it, properties)
- Vectors, dot and cross products, angles, projection (How to use in right situation)
- Complex numbers (How to work with them and use them when needed)
- Eigenvalues and eigenvectors (How to compute and use them, diagonalization, applications)

### System of Linear Equations and Matrix Algebra:

- How to solve a system (RREF, parameters, homogeneous systems, .. ...)
- Analyze for Solutions (When do we get no solution, unique or infinitely many..)
- Apply in appropriate situations.
- Matrix algebra (all operations, transpose, linear combination,  $AX=B$ , dot product)
- Matrix multiplications, inverses, inversion algorithm, elementary matrices, adjugate, role in systems of linear equations.

### Determinants

- Cofactor expansion, properties of determinant,  $A \operatorname{adj}(A) = \det(A)I, \dots$
- Matrix inverse
- Polynomial interpolation.

### Vector Geometry

- Vectors, operations, length, angles, ..
- Lines and Planes (Equations, ...)
- Shortest distances and closest points (between points, lines and planes)
- Areas, volumes.
- Linear transformation in  $\mathbb{R}^n$  (matrix of the transformation, standard examples of linear transformations, composition and inverses)

### Complex Numbers

- Standard form, polar form, absolute value and algebra.
- Powers of complex numbers,  $n^{\text{th}}$  roots of complex numbers.
- Roots of quadratics (real or complex coefficients).
- Use and role of complex numbers.

### Spectral Theory

- Eigenvalues/eigenvectors, diagonalization and what it is for.
- Applications to Markov Chains, steady state, Linear Dynamical Systems.