

MATH 311-504

Topics in Applied Mathematics

**Lecture 13:**  
**Review for Test 1.**

# Topics for Test 1

*Vectors (Williamson/Trotter 1.1–1.2, 1.4, 1.6, 2.2C)*

- Vector addition and scalar multiplication
- Length of a vector, angle between vectors
- Dot product, orthogonality
- Cross product, mixed triple product
- Linear dependence

*Analytic geometry (Williamson/Trotter 1.3, 1.5–1.6)*

- Lines and planes, parametric representation
- Equations of a line in  $\mathbb{R}^2$  and of a plane in  $\mathbb{R}^3$
- Distance from a point to a line in  $\mathbb{R}^2$  or from a point to a plane in  $\mathbb{R}^3$
- Area of a triangle and a parallelogram in  $\mathbb{R}^3$
- Volume of a parallelepiped in  $\mathbb{R}^3$

# Topics for Test 1

*Systems of linear equations (Williamson/Trotter 2.1–2.2)*

- Elimination and back substitution
- Elementary operations, Gaussian elimination
- Matrix of coefficients and augmented matrix
- Elementary row operations
- Row echelon form and reduced row echelon form
- Free variables, parametric representation of the solution set
- Homogeneous systems, checking for linear independence of vectors