MATB61 Midterm Preparation - Linear Algebra Summary

Refer to Textbook Chapter 0 Linear Algebra Review

Topics

Here is a comprehensive list of the linear algebra topics you need to know for this course:

- Matrices

  - Linear systems
  - Augmented matrices
  - Scalar multiplication
  - The transpose of a matrix

- Gauss-Jordan row reduction

  - Homogenous systems

- Inverse of a matrix

  - Procedure for computing A^{-1}

- Subspaces

- Linear independence and basis

Definitions

Definition 1.1 *An **elementary row operation** on an $m \times n$ matrix $A = [a_{ij}$ is any of the following operations.*

- *Type 1. Interchange rows r and s of A so that elements $a_{r1}, a_{r2}, ..., a_{rn}$ replace elements $a_{s1}, a_{s2}, ..., a_{sn}$ and the elements $a_{s1}, a_{s2}, ..., a_{sn}$ replace the elements $a_{r1}, a_{r2}, ..., a_{rn}$.*

- *Type 2. Multiply row r of A by $c \neq 0$. That is, the elements $a_{r1}, a_{r2}, ..., a_{rn}$ are replaced by the elements $ca_{r1}, ca_{r2}, ..., ca_{rn}$.*

- *Type 3. Add a multiple d of row r of A to row s of A, writing the result in row s. That is, the elements $a_{s1} + da_{r1}, a_{s2} + da_{r2}, ..., a_{sn} + da_{rn}$ replace the elements $a_{s1}, a_{s2}, ..., a_{sn}$.*

Definition 1.2 *A linear system of the form*

$$a_{11}x_1 + a_{12}x_2 + ... + x_{1n}x_n = 0$$
$$a_{21}x_1 + a_{22}x_2 + ... + x_{2n}x_n = 0$$
$$\vdots$$
$$a_{m1}x_1 + a_{m2}x_2 + ... + x_{mn}x_n = 0$$

*is called a **homogenous system**, which always has the trivial solution $x_1 = x_2 = ... = x_m = 0$.*