Section 1

MANE 3351

Subsection 1

Lecture 20

Classroom Management

Agenda

- Summary of operations on Vectors, Matrix Multiplication, Three-Dimensional Transformations
- Determinants
- Introduction to Inverse Matrix
- Lab Assignment 9 today

Subsection 2

Resources

Handouts

- Lecture 20 slides
- Lecture 20 slides marked
- Linear Algebra Handout

Calendar

Date	Lecture Topic	Lab Topic
11/11	Lecture 20 - Determinant	Lab 9
11/13		
11/18		
11/20		
11/25		
11/27		
12/2		
12/4		
12/9	**Final exam 1:15 - 3:00 pm**	

Lecture 20 Overview

- Vector Operations,
- Determinants, and
- Matrix Inversion

Vectors

A **vector** $\mathbf{x} \in \mathbb{R}^n$

$$\mathbf{x} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}$$

can be thought of as a one-dimensional array of numbers and is written as

- $\mathbf{x}$ is often called a column vector
- the dimension of $\mathbf{x}$ is $(n \times 1)$

A row vector can be written as

$$\mathbf{y} = \begin{bmatrix} y_1 & y_2 & \cdots & y_m \end{bmatrix}$$

- the dimension of $\mathbf{y}$ is $(1 \times m)$

Scalar Product

$$\alpha \mathbf{x} = \begin{bmatrix} \alpha x_1 \\ \alpha_2 x_2 \\ \vdots \\ \alpha x_n \end{bmatrix}$$

for α (a constant or scalar)

Addition/Subtraction

$$\mathbf{x} \pm \mathbf{y} = \begin{bmatrix} x_1 \pm y_1 \\ x_2 \pm y_2 \\ \vdots \\ x_n \pm y_n \end{bmatrix}$$

- Note that the dimensions of **x** and **y** must be identical

Matrices

A **matrix** is a two-dimensional array of numbers written as

$$\mathbf{A} = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1m} \\ a_{21} & a_{22} & \cdots & a_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nm} \end{bmatrix}$$

- A matrix has two dimensions and can be written as $A_{n\times m}$ where n is the number of rows and m is the number of columns
- A column vector can be considered an $n \times 1$ matrix and a row vector can be considered an $1 \times m$ matrix
- Matrices may or may not be square

Determinant

- The Determinant Video
- Determinant of a Matrix Website

Ex: Determinant of a 2x2 Full Rank Matrix

EX: Determinant of a 2x2 Non-Full Rank Matrix

Ex: Shortcut for Determinant of a 3x3 Matrix

Ex: Method of Minors for finding determinant of 3x3 or higher dimension Matrix

Inverse Matrix

Inverse Matrices Video

Linear Algebra Handout