

## MATRIX ALGEBRA

Text: 7.1-7.2

Lecture Notes: N/A

Lecture Slides: N/A

Quote of Short Homework Two	
Sir, our math shows that the bird is equal to or greater than the word.	
	The Family Guy : Season 7 Episode 2 (2008)

## 1. GOALS

The goal of this assignment is to practice elementary matrix algebra, which is, for the most part, the same as the algebra of vectors. The key difference is how we take products. In calculus you were taught to take the *dot-product* and *cross-product* of two vectors. A matrix product will be different but familiar since it is built upon the standard dot-product. After this assignment the student should:

- Understand how to add, scale and multiply matrices.

## 2. OBJECTIVES

To achieve the previous goals the student will meet the following objectives:

- (1) Attend and take notes during the second lecture and ask any introductory questions they might have after the row-reduction example.
- (2) Read section 7.1-7.2 of the text book paying particular attention to pages 275-276 and pages 278 through 281. Specifically, if the students fail to follow the in-class example they should work through the steps example 1 and example 6 of section 7.2.
- (3) Compute matrix additions, products and scalings with some example matrices.

## 3. PROBLEMS

Let  $i = \sqrt{-1}$  define the following matrices,

$$\mathbf{A}_1 = \frac{1}{\sqrt{2}} \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}, \quad \mathbf{A}_2 = \frac{1}{\sqrt{2}} \begin{pmatrix} 0 & -i & 0 \\ i & 0 & -i \\ 0 & i & 0 \end{pmatrix}, \quad \mathbf{A}_3 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & -1 \end{pmatrix}.$$

Compute the following:

- (1)  $\mathbf{A}_1 \mathbf{A}_2$ .
- (2)  $\mathbf{A}_2 \mathbf{A}_1$ .
- (3)  $2i(\mathbf{A}_1 \mathbf{A}_2 - \mathbf{A}_2 \mathbf{A}_1)$ .<sup>1</sup>

I am not asking you to but if you want to do more then you can calculate  $\mathbf{A}_2 \mathbf{A}_3 - \mathbf{A}_3 \mathbf{A}_2$  and figure out how this relates to  $\mathbf{A}_1$ .

<sup>1</sup>You should get  $\mathbf{A}_3$ . If you didn't then you should check your work.