

CSCI 6342: Linear Algebra: A Computational Approach. Assignment 2

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1 Pen and Paper Problems

1. **I** is Unique.

Let **I** be the identity matrix for an n by n matrix. Let **A** and **B** be n by n matrices. Assume there is a matrix **J** such that,

$$\mathbf{JA} = \mathbf{A} \tag{1}$$

Similarly we know that,

$$\mathbf{BI} = \mathbf{B} \tag{2}$$

Replace **A** with **I** and you get:

$$\mathbf{JI} = \mathbf{I} \tag{3}$$

Replace **B** with **J** and you get:

$$\mathbf{JI} = \mathbf{J} \tag{4}$$

Since **JI** equal both **J** and **I**, then **J = I**

2. $\mathbf{AA}^{-1} = \mathbf{I}$

Let **A** be the inverse of **B** such that $\mathbf{AB} = \mathbf{I}$.

$$\mathbf{A} = \mathbf{A} \tag{5}$$

As per how identity matrices work,

$$\mathbf{A} = \mathbf{IA} \tag{6}$$

By definition, $\mathbf{AB} = \mathbf{I}$.

$$\mathbf{A} = (\mathbf{AB})\mathbf{A} \tag{7}$$

By associativity with matrix multiplication we get,

$$\mathbf{A} = \mathbf{A}(\mathbf{BA}) \tag{8}$$

Therefore,

$$\mathbf{BA} = \mathbf{I} \tag{9}$$