

Homework 1

Numerical Linear Algebra

August 30, 2017

1 Problems for everybody

1. Let $\vec{u} \in \mathbb{R}^n$ and $\vec{v} \in \mathbb{R}^n$. Prove that $\vec{u}\vec{v}^T$ is a rank one matrix.
2. If $p(x) = c_0 + c_1x + c_2x^2 + c_3x^3 + \dots x^{n-1}$, find the matrix representation of the operator defined by

$$\mathcal{L}(p(x)) = \int_1^x p(x) dx.$$

3. Give an example of a matrix $A \in \mathbb{R}^{4 \times 4}$ such that $\text{Range}(A) = \text{Null}(A)$. Prove that there does not exist a matrix $A \in \mathbb{R}^{5 \times 5}$ such that $\text{Range}(A) = \text{Null}(A)$.
4. Problems 1.1, 1.3, 1.4.