Matrix Theory (EE5609) Assignment-2

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***Abstract*—This document contains the proof for the problem based on Cayley-Hamilton Theorem.**

Download latex-tikz codes from

https://github.com/EE20RESCH11008/Matrix−Theory/tree/master/Assignment−2

1 Problem

If A=$\begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$, show that $A^2 - 5A + 7I = 0$.

2 Solution

The characteristic equation is

$$|\mathbf{A} - \lambda\mathbf{I}| = 0 \tag{2.0.1}$$

$$\implies det\begin{pmatrix} 3-\lambda & 1 \\ -1 & 2-\lambda \end{pmatrix} = 0 \tag{2.0.2}$$

$$\implies (3-\lambda)(2-\lambda) + 1 = 0 \tag{2.0.3}$$

$$\lambda^2 - 5\lambda + 7 = 0 \tag{2.0.4}$$

By Cayley-Hamilton theorem, every square matrix satisfies its characteristic equation. Hence, proved

$$\mathbf{A}^2 - 5\mathbf{A} + 7\mathbf{I} = 0 \tag{2.0.5}$$