8. Homework 8

The following problems are due Thursday (Nov 15). I will post the answers after I grade it.

8.1. Take the complex matrix

\[ A = \begin{pmatrix} 0 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}. \]

I.e.: \( Ae_1 = 0, Ae_2 = Ae_3 = e_1 \) and put it into Jordan canonical form: Find an invertible complex matrix \( B \) so that \( B^{-1}AB \) is in Jordan canonical form. What is the corresponding decomposition of \( \mathbb{C}^3 \) as a module over \( \mathbb{C}[T] \)?

8.2. Over the real numbers there are irreducible polynomials of degree 2:

\[ p(x) = x^2 + bx + c \]

So, \( \mathbb{R}[T]/(p(T)^2) \) is a cyclic module over \( \mathbb{R}[T] \). Find the corresponding \( 4 \times 4 \) matrix.