Math 119A Extra Credit

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1 Problem 1

Provide a complete proof of the Jordan Canonical form. That is, show that any finite-dimensional $\mathbb{C}$-vector space V can be expressed as the direct sum of generalized eigenspace os an arbitrarily chosen operator $T \in L(V)$. Show that T can be uniquely written as the sum of a semisimple and nilpotent operator. Moreover, one can pick a basis V such that the matrix representing the nilpotent consists of elementary nilpotent blocks.
Proof.

$\square$

2 Problem 2

Show that the set of operators with n distinct eigenvalues is dense and open in $L(\mathbb{R}^n)$.
Proof.

$\square$

3 Problem 3

Show that the set of operators giving rise to contractions is open but not dense in $L(\mathbb{R}^n)$.
Proof.

$\square$

4 Problem 4

Show that the set of operators giving rise to hyperbolic flows is open and dense in $L(\mathbb{R}^n)$.
Proof.

$\square$