Math 232 Spring 2006 Project 11

Due April 21

Name

Be sure to re-read the WRITING GUIDELINES rubric, since it defines how your project will be graded. In particular, you may discuss this project with others but **you may not collaborate on the written exposition of the solution.**

"*Do not imagine that Mathematics is hard and crabbed, and repulsive to common sense. It is merely the etherealization of common sense.*" – Lord Kelvin

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Do One (1) of the Following

1. Show that the vector spaces M_{mn} and M_{nm} are isomorphic by finding a function $T : M_{mn} \to M_{nm}$ and proving that T is:

   (a) a linear transformation

   (b) injective

   (c) surjective

2. Let $V = F(\mathbf{C}, \mathbf{C})$ be the vector space of all functions $f : \mathbf{R} \to \mathbf{R}$ that have domain and codomain the set of real numbers. [You do not have to prove that V is a vector space but you should recall the definitions of addition, scalar multiplication and equality of functions.] Define a function $T : V \to V$ by $T(f) = f_1$ where $f_1(t) = f(t-1)$. Geometrically, this function has the effect of shifting the graph of f one unit to the right.

   Prove that T is an isomorphism.