Name _____ Class Time _____

Math 2270 Extra Credit Problems
Chapter 2
January 2007

Due date: See the internet due date for 2.1, which is the due date for these problems. Records are locked on that date and only corrected, never appended.

Submitted work. Please submit one stapled package per problem. Kindly label problems **Extra Credit**. Label each problem with its corresponding problem number. You may attach this printed sheet to simplify your work.

Problem Ex2.1-16. (**Invertible** T)

Decide invertibility of $T(\mathbf{x}) = A\mathbf{x}$ for the following matrices A. Then find the matrix of T^{-1}, in each case.

$$\begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}, \quad \begin{pmatrix} 1 & 1 \\ -1 & 1 \end{pmatrix}, \quad \begin{pmatrix} 1 & 1 \\ -1 & -1 \end{pmatrix}.$$

Problem Ex2.1-43. (**Matrix of** T)

(a) Suppose $\mathbf{v}$ has components 2, -2, 5. Find the matrix of $T(\mathbf{x}) = \mathbf{v} \cdot \mathbf{x}$.
(b) Prove that every linear transformation T from $\mathcal{R}^3$ into $\mathcal{R}^1$ can be written as $T(\mathbf{x}) = \mathbf{v} \cdot \mathbf{x}$ for some vector $\mathbf{v}$.

Problem Ex2.1-46. (**Matrix of** T)

(a) Let $T(\mathbf{x}) = B(A(\mathbf{x}))$ where

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 1 \\ -1 & 1 \end{pmatrix}.$$

Find the matrix of T.
(b) What is the matrix of T defined by $T(\mathbf{x}) = B^2(A(\mathbf{x}))$?

Problem Ex2.2-18. (**Reflection line equation**)

Let a reflection T have matrix $\frac{1}{2}\begin{pmatrix} \sqrt{3} & 1 \\ 1 & -\sqrt{3} \end{pmatrix}$. Find the equation for the line L of reflection.

Problem Ex2.2-26. (**Matrix of** T)

(a) Find the scaling matrix A if $T\left(\begin{pmatrix} 2 \\ -1 \end{pmatrix}\right) = \begin{pmatrix} 8 \\ -4 \end{pmatrix}$.
(b) Find the projection matrix A if $T\left(\begin{pmatrix} 2 \\ 3 \end{pmatrix}\right) = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$.

Problem Ex2.2-39. (**Composite linear transformations**)

Each of the matrices below is a standard geometric linear transformation followed by a scaling. Find the scale factor.

$$\begin{pmatrix} 2 & 2 \\ 2 & 2 \end{pmatrix}, \quad \begin{pmatrix} 6 & 0 \\ -2 & 6 \end{pmatrix}, \quad \begin{pmatrix} 3/4 & 1 \\ 1 & -3/4 \end{pmatrix}.$$

End of extra credit problems chapter 2.