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Name \_\_\_\_\_

Section H J

Subsection left center right

# Mathematics 1553

Written Homework 9

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1. Consider the matrix

$$A = \begin{pmatrix} 1/2 & 1/2 & 1/2 & 1/2 \\ 1/2 & 1/2 & -1/2 & -1/2 \\ 1/2 & -1/2 & 1/2 & -1/2 \\ 1/2 & -1/2 & -1/2 & 1/2 \end{pmatrix}$$

Compute  $A^T A$ .

What does your answer say about the columns of  $A$ ?

Choose two linearly independent vectors  $u$  and  $v$  in  $\mathbb{R}^4$  (choose them so no entry is equal to 0). Write them here.

$$u =$$

$$v =$$

Compute the following.

$$\|u\| =$$

$$\|v\| =$$

$$u \cdot v =$$

Now compute the following.

$$T_A(u) =$$

$$T_A(v) =$$

$$\|T_A(u)\| =$$

$$\|T_A(v)\| =$$

$$T_A(u) \cdot T_A(v) =$$

Summarize what these calculations suggest about  $A$  (or rather  $T_A$ ).

*Extra credit (two points).* Prove your hypothesis about  $A$ .