

Name : _____

Homework #5

Math 301, Spring 2013

Due Wednesday, March 6, 2013

These homework problems are to be turned in and will be graded for credit. Turn in your work on separate pages, using this as a cover sheet. Please staple your work together. For full credit, you must show all of your work.

1. What permutation makes PA upper triangular? Which permutation matrices P_1 and P_2 make P_1AP_2 lower triangular?

$$A = \begin{bmatrix} 0 & 0 & 6 \\ 1 & 2 & 3 \\ 0 & 4 & 5 \end{bmatrix}$$

2. If $A = A^T$ and $B = B^T$, which of these matrices are guaranteed to be symmetric?

- (a) $A^T - B^T$
- (b) $(A + B)(A - B)$
- (c) ABA
- (d) $ABAB$

3. The matrix $A = \begin{bmatrix} 2 & -2 \\ 2 & -2 \end{bmatrix}$ is a “vector” in vector space \mathbf{M} of all 2×2 matrices. Write down the zero vector in this space, the vector $\frac{1}{2}A$, and the vector $-A$. What matrices are in the smallest subspace containing A ?

4. Describe the column space (lines or spaces) of these matrices

$$A = \begin{bmatrix} 1 & 2 \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 1 & 0 \\ 0 & 2 \\ 0 & 0 \end{bmatrix} \quad \text{and} \quad C = \begin{bmatrix} 1 & 0 \\ 2 & 0 \\ 0 & 0 \end{bmatrix}$$

5. Construct a 3 by 3 matrix whose column space contains $(1, 1, 0)$ and $(1, 0, 1)$ but not $(1, 1, 1)$. Construct a 3 by 3 matrix whose column space is only a line.