

EXAM 1/Chapter 1-2.5 OF SUMMER 18 GUIDED NOTEBOOK AND LINEAR
TRANSFORMATIONS (NEW 2.5 OF NB)

100 POINTS POSSIBLE

YOUR WORK MUST BE ORGANIZED AND CLEAR

PART 1/66 POINTS POSSIBLE/NO GRAPHING CALCULATOR IS PERMITTED

1. (6 POINTS) Find the solution set of the system of equations represented in the coefficient matrix of a homogeneous system of equations. If applicable, please parameterize.

$$\begin{bmatrix} 1 & 0 & 2 & 0 & -3 \\ 0 & 1 & 3 & 7 & 12 \\ 0 & 0 & 1 & 5 & -2 \end{bmatrix}$$

2. (10 POINTS) Please circle true or false.

- a. T F A homogeneous system of equations always has infinitely many solutions.
- b. T F Multiplication of diagonal matrices of order n is commutative.
- c. T F If a basis for a vector space consists of 4 vectors, all bases in that space must consist of 4 vectors.
- d. T F The zero matrix is an elementary matrix.
- e. T F If $AC = BC$ then $A = B$.

3. (6 POINTS) Prove that if A and B are idempotent and $AB = BA$, then is AB idempotent. Recall that A is idempotent if $A^2 = A$.
4. (6 POINTS) Prove the following distributive property for vectors in R^n :
 $(c + d)\mathbf{u} = c\mathbf{u} + d\mathbf{u}$.
5. (8 POINTS) Determine whether $W = \{(x, 0) : x \text{ is a real number}\}$ is a subspace of R^2 .

6. (16 POINTS) Consider the following matrices A and B .

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 0 \\ -2 & 0 & 3 \end{bmatrix}$$

$$B^{-1} = \begin{bmatrix} 3 & -1 & 0 \\ 0 & 10 & 2 \\ 1 & -2 & 0 \end{bmatrix}$$

a. (8 POINTS) Find A^{-1} .

b. (2 POINTS) Find $(A^T)^{-1}$.

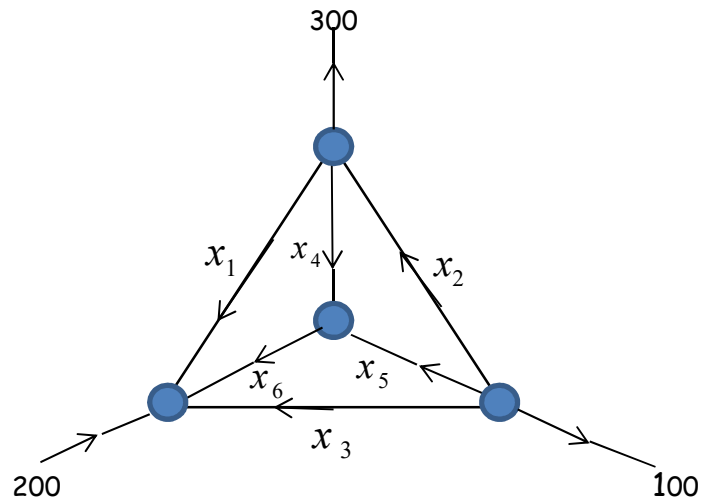
c. (6 POINTS) Find $(AB)^{-1}$.

7. (6 POINTS) The figure shows the flow through a network.

Set up the system for

$$x_i, i = 1, 2, \dots, 6$$

****You do not need to solve!**



8. (8 POINTS) Show that the set, together with the indicated operations, is not a vector space by identifying one of the ten vector space axioms that fail.

$$W = \{(x, x^2) : x \text{ is a real number}\} \text{ with the standard operations in } \mathbb{R}^2.$$