

PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam

Linear Algebra 2

04-02-2014

Solutions must be complete in order to receive full credit.

1. (5 pts) Write the matrix A as the product of elementary matrices.

$$A = \begin{bmatrix} 1 & 0 & -2 \\ 5 & 0 & -9 \\ 0 & 2 & 0 \end{bmatrix}$$

2. (5 pts) Evaluate $\det A$ by cofactor expansion along the second column.

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

3. (5 pts) Write the vector $v = (9, 3, -1)$ as a linear combination of v_1, v_2, v_3 .

$$\begin{aligned} v_1 &= (1, 1, -1) \\ v_2 &= (0, 2, 1) \\ v_3 &= (2, 1, 3) \end{aligned}$$

4. (5 pts) Find a basis for the nullspace of the matrix A .

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

5. (10 pts) Solve the system of differential equations using the diagonalization method.

$$\begin{cases} x' = x + y + 2z \\ y' = \quad 2y + 2z \\ z' = \quad \quad 3z \end{cases}$$

6. (10 pts) Solve the system of differential equations $X' = AX$ using matrix exponential by writing $A = B + C$ such that $BC = CB$.

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

-Amin Witno