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# Exam 1

Linear Algebra, Dave Bayer, September 26, 2006

Name: \_\_\_\_\_

[1] (5 pts)	[2] (5 pts)	[3] (5 pts)	[4] (5 pts)	[5] (5 pts)	TOTAL

Please work only one problem per page, starting with the pages provided, and number all continuations clearly. Only work which can be found in this way will be graded.

Please do not use calculators or decimal notation.

[1] What is the set of all solutions to the following system of equations?

$$\begin{bmatrix} 2 & 1 & 4 \\ 1 & 2 & 4 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 3 \end{bmatrix}$$

[2] What is the set of all solutions to the following system of equations?

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & -1 & 1 & -1 \\ -1 & 0 & -1 & 0 \\ 0 & -1 & 0 & -1 \end{bmatrix} \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 0 \\ -1 \\ -1 \end{bmatrix}$$

[3] Express the following matrix as a product of elementary matrices:

$$\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 2 \\ 3 & 1 & 8 \end{bmatrix}$$

[4] What are the determinants of the following matrices? What is the determinant of the corresponding  $n \times n$  matrix?

$$\begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}, \quad \begin{bmatrix} 3 & 1 & 0 \\ 1 & 3 & 1 \\ 0 & 1 & 3 \end{bmatrix}, \quad \begin{bmatrix} 3 & 1 & 0 & 0 \\ 1 & 3 & 1 & 0 \\ 0 & 1 & 3 & 1 \\ 0 & 0 & 1 & 3 \end{bmatrix}, \quad \begin{bmatrix} 3 & 1 & 0 & 0 & 0 \\ 1 & 3 & 1 & 0 & 0 \\ 0 & 1 & 3 & 1 & 0 \\ 0 & 0 & 1 & 3 & 1 \\ 0 & 0 & 0 & 1 & 3 \end{bmatrix}$$

[5] What is the determinant of the following matrix? What is the determinant of the corresponding  $n \times n$  matrix?

$$\begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 2 & 2 & 2 & 2 & 1 \\ 3 & 3 & 3 & 2 & 1 \\ 4 & 4 & 3 & 2 & 1 \\ 5 & 4 & 3 & 2 & 1 \end{bmatrix}$$



