

**Exam 1**

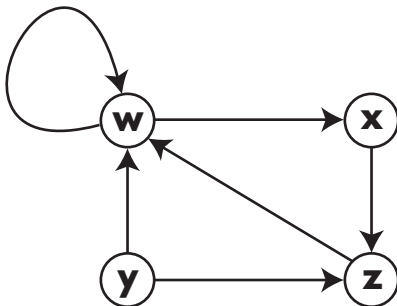
Linear Algebra, Dave Bayer, September 24, 2013

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[1]	[2]	[3]	[4]	[5]	Total

If you need more than one page for a problem, clearly indicate on each page where to look next for your work.

[1] Using matrix multiplication, count the number of paths of length ten from  $w$  to itself.



[2] Solve the following system of equations.

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

[3] Express  $A$  as a product of elementary matrices, where

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

[4] Find a system of equations having as solution set the following affine subspace of  $\mathbb{R}^4$ .

$$\begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} + s \begin{bmatrix} 2 \\ 3 \\ 4 \\ 5 \end{bmatrix}$$

[5] Find the intersection of the following two affine subspaces of  $\mathbb{R}^4$ .

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

$$\begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ 1 \\ 3 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 0 \\ 3 & 0 \end{bmatrix} \begin{bmatrix} c \\ d \end{bmatrix}$$