F15 Exam 1 Problem 1 [Reserved for Score]

Linear Algebra, Dave Bayer

Name ______________________________ Uni ____________

[1] Solve the following system of equations.

$$\begin{bmatrix} 0 & 1 & 1 & 2 & 3 \\ 1 & 1 & 2 & 3 & 5 \\ 1 & 2 & 3 & 5 & 8 \end{bmatrix} \begin{bmatrix} v \\ w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 4 \\ 6 \end{bmatrix}$$

$$\boxed{\begin{bmatrix} v \\ w \\ x \\ y \\ z \end{bmatrix} = \qquad\qquad\qquad\qquad}$$

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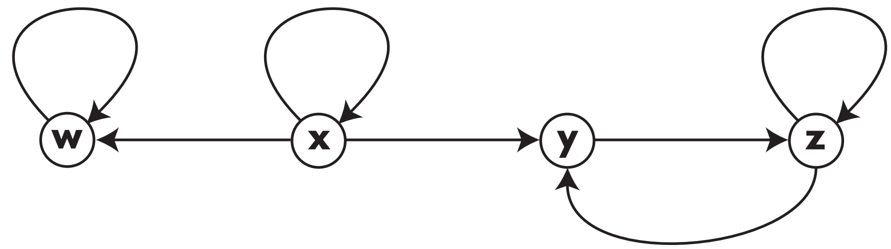
[2] Using matrix multiplication, count the number of paths of length ten from x to z.



number of paths $=$

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

$$A \;=\; \begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix}$$

$$\boxed{A \;=\; \begin{bmatrix} \square & \square \\ \square & \square \end{bmatrix} \begin{bmatrix} \square & \square \\ \square & \square \end{bmatrix} \begin{bmatrix} \square & \square \\ \square & \square \end{bmatrix} \begin{bmatrix} \square & \square \\ \square & \square \end{bmatrix}}$$

[4] Find all 2×2 matrices A such that

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

$$\boxed{A = \begin{bmatrix} \square & \square \\ \square & \square \end{bmatrix} + \begin{bmatrix} \square & \square \\ \square & \square \end{bmatrix} s + \begin{bmatrix} \square & \square \\ \square & \square \end{bmatrix} t}$$

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

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

$$\begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 2 \\ 3 \end{bmatrix} + \begin{bmatrix} -1 \\ 2 \\ 1 \\ 0 \end{bmatrix} u$$

$$\boxed{\begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \qquad\qquad}$$