# Exam 1, 8:40am

Linear Algebra, Dave Bayer, October 4, 2022

**Name:** ______________________________ **Uni:** ______________

| [1] | [2] | [3] | [4] | [5] | **Total** |
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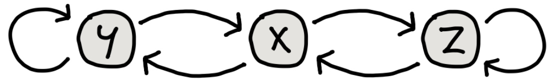
If you need more that one page for a problem, clearly indicate on each page where to look next for your work.

[1] Solve the following system of equations.

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

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



[3] Find all $2 \times 2$ matrices $A$ that satisfy the condition

$$A \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

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

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

[5] Find the intersection of the following two affine subspaces of $\mathbb{R}^3$.

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

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} + \begin{bmatrix} -2 & -5 \\ 1 & 1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} b \\ c \end{bmatrix}$$