Linear Algebra: Workshop Questions 3

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1 Questions

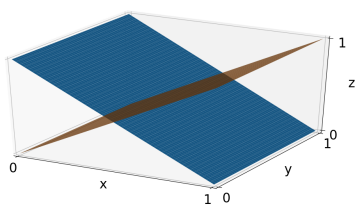
Exercise 1.1. Sketch the lines defined by this system of simultaneous equations:

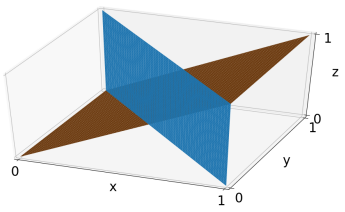
$$x - y = 0,$$
$$x + y = 2,$$
$$2x - y = 3.$$

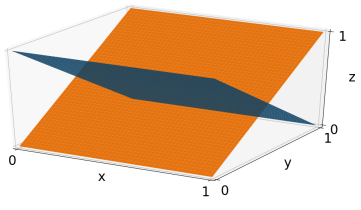
Do these lines have a triple intersection? What does this mean for the system of equations?

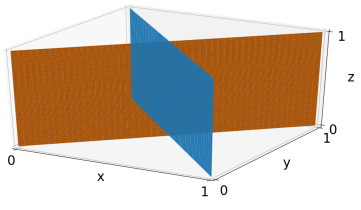
Exercise 1.2. Which picture represents the system of equations in x, y, z:

$$y + z = 1$$
$$y - z = 0?$$









Exercise 1.3. True or false? In each case, give a proof or a counterexample.

(a) The sum of two invertible n-by-n matrices is again invertible.

(b) If A, B, C are invertible then $C^{-1}B^{-1}A^{-1}$ is the inverse of ABC.

(c) Let Π_1, Π_2, Π_3 be planes in $\mathbb{R}^3$. Then $\Pi_1 \cap \Pi_2 \cap \Pi_3$ contains at least one point.

Exercise 1.4. Which matrix is the inverse of $\begin{pmatrix} 1 & 0 & 2 \\ -1 & 1 & 3 \\ 1 & 0 & 0 \end{pmatrix}$?

(a) $\begin{pmatrix} 1 & 0 & 0 \\ -3/2 & 1 & 5/2 \\ 1/2 & 0 & -1/2 \end{pmatrix}$

(b) $\begin{pmatrix} 0 & 1 & 0 \\ -3/2 & 0 & -1/2 \\ 1/2 & 0 & 5/2 \end{pmatrix}$

(c) $\begin{pmatrix} 0 & 0 & 1 \\ -3/2 & 1 & 5/2 \\ 1/2 & 0 & -1/2 \end{pmatrix}$

(d) $\begin{pmatrix} 0 & 0 & 0 \\ -3/2 & 0 & 5/2 \\ 1/2 & 1 & -1/2 \end{pmatrix}$

Exercise 1.5. What is the determinant of $\begin{pmatrix} 2 & 1 & 3 \\ -1 & 0 & 4 \\ 1 & 1 & 1 \end{pmatrix}$?

(a) 6

(b) 11

(c) -11

(d) None of the above.