1️⃣

Daily Math Problem - DAY 1

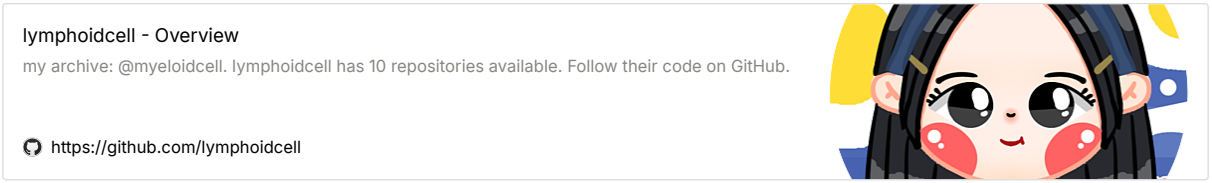
The easiest problem you will ever encounter!!! 😄

Problem Metadata

Date: @November 11, 2025

Problem Number: #1

Problem Curator: @Phanie



Indonesian version: Daily Math - HARI 1

Vector Equality in $\mathbb{R}^n$

Category: Machine Learning Math - Linear Algebra

Difficulty Level: Beginner

Problem Statement

(a) The following are vectors:

$(2, -5), (7, 9), (0, 0, 0), (3, 4, 5)$

The first two vectors belong to $\mathbb{R}^2$, whereas the last two belong to $\mathbb{R}^3$.

The third is the zero vector in $\mathbb{R}^3$.

(b) Find x, y, z such that $(x - y, x + y, z - 1) = (4, 2, 3)$.

By definition of equality of vectors, corresponding entries must be equal.

Source and Attribution

Primary Source:

Schaum's Outline of Linear Algebra, Fourth Edition (Schaum's Outline Series) by Seymour Lipschutz, Marc Lipson

Related Materials:

- **Linear Algebra Done Right** by Sheldon Axler
- Other books (if any)

Motivation and Context

Vectors in $\mathbb{R}^n$ formalize "ordered lists of numbers." Equality is **entrywise**; operations are addition and scalar multiplication. The problem above checks recognition of vector dimension and uses quality to turn one vector equation into a small linear system.

Relevance to ML/DL/AI:

- Data samples/features are vectors in $\mathbb{R}^n$.
- Zero vector, dimensionality, and componentwise equality underpin batching, broadcasting, and shape checks in NumPy/PyTorch.
- Solving for (x, y, z) from a vector equation is the same algebra used in parameter fitting with linear constraints.

Theoretical Significance:

- Definitions: $\mathbb{R}^n$, zero vector, vector equality.
- Operations: vector addition, scalar multiplication (parallelogram rule).
- Translating a vector identity to a system of linear equations.

📐 ***Just in case not knowing the terms**:

- 'entrywise' means that operations or comparisons are performed on corresponding entries (elements) of vectors or matrices, one entry at a time.
- 'componentwise' (also called entrywise or element-wise).

Hints and Guidance

Consider:

- Equality of vectors: $(a_1, ..., a_n) = (b_1, ..., b_n) \Leftrightarrow a_i = b_i$ for all i
- Dimensionality: a 2-tuple is in $\mathbb{R}^2$; a 3-tuple is in $\mathbb{R}^3$; $(0, \ldots, 0)$ is the zero vector.
- Approach: From $(x - y, x + y, z - 1) = (4, 2, 3)$, write the three scalar equations and solve the 2×2 system for x, y, then get z.

Discussion Space

Questions:

- Any confusion about why vectors with the same multiset of numbers (e.g., $(1, 2, 3)$ vs $(2, 3, 1)$) are not equal?
- Do you see how dimension mismatches (e.g., comparing a pair to a triple) invalidate equality?

Initial Observations:

- From equality: $x - y = 4, x + y = 2$.
- From the third component: $z - 1 = 3$.
- The first two listed vectors are in R^2; the latter two are in R^3; $(0, 0, 0)$ is the zero vector.

Status: Completed ✅ | Solvers: Phanie & Phanie's Mom (DG)

Solutions Available

Participant	Solution Link	Date Submitted	Notes
Phanie's Mom	https://github.com/lymphoidcell/daily-math/blob/main/Solutions/Phanie's%20Mom/Phanie's%20Mom%20-%20DAY%201.png	@November 11, 2025	Using eliminations followed by substitution method

Participant	Solution Link	Date Submitted	Notes
Phanie	Daily Math Solution - DAY 1	@November 11, 2025	📓 Chapter 1: Introduction to Vectors in Rⁿ and Cⁿ

Reference to understand the topic:

Source	Topic	Brief Description
https://www.youtube.com/watch?v=J7DzL2_Na80&t=430s	Addresses the fundamental problem of solving a system of linear equations ($Ax = b$)	The geometric implications of solutions, including the "big picture" question of whether solutions exist for every right-hand side vector, which depends on whether the column combinations fill the space, leading to discussions of non-singular (invertible) and singular matrices.
https://youtu.be/oKqtgz2eo-Y?si=NfBkGGlOcPb2g4tQ	Elimination and substitution	This algebra video tutorial explains how to solve systems of equations by elimination and how to solve systems of equations by substitution with 2 variables.
https://www.youtube.com/watch?v=seet9VyHo3Q	Gaussian elimination	A step by step algorithm for performing the Gaussian elimination method on a matrix.

https://www.youtube.com/watch?v=J7DzL2_Na80&t=430s

https://youtu.be/oKqtgz2eo-Y?si=NfBkGGlOcPb2g4tQ

https://www.youtube.com/watch?v=seet9VyHo3Q