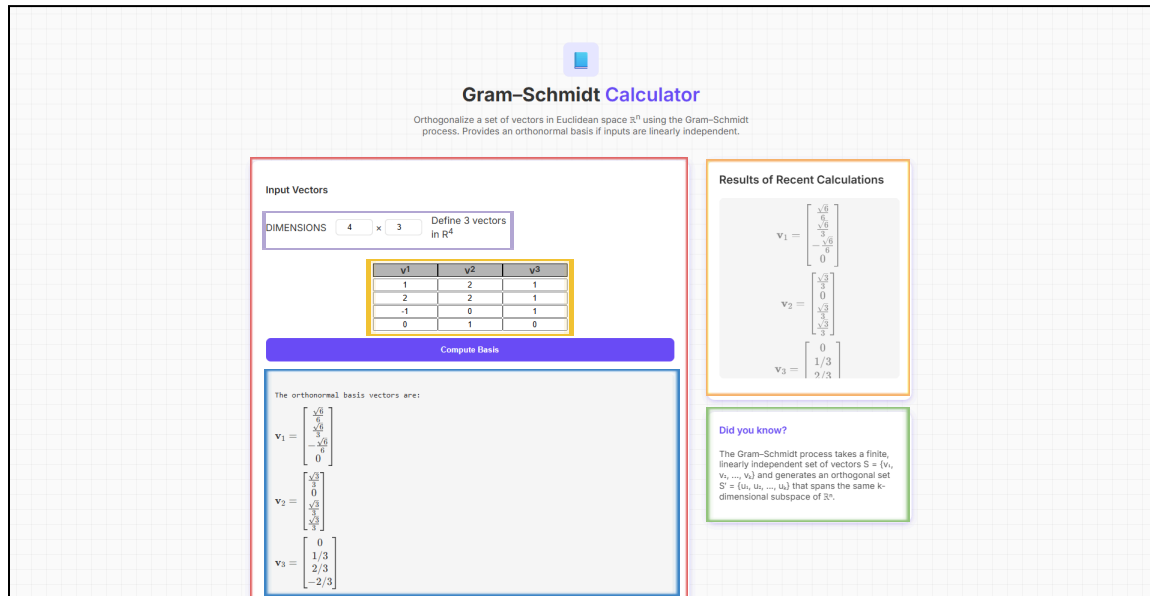


## Interface Navigation



- Divided into *three primary zones*

### A. Input Vectors (Left side)

- This is the primary workspace where we put the mathematical constraints of the problem

**Dimensions:** n (rows) the dimension of each vector and k (columns) the number of vectors.

**Table:** Table where components are entered.

**Output:** Panel where results will appear

### B. Recent Calculation (Top Right Side)

- Recent Calculation panels keep track of your output history, which allows you to verify and double check previously entered data

### C. Did You Know? (Bottom Right Side)

- Contains definition and the mathematical theory underlying the Gram-Schmidt process.

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## Step-by-Step Operation:

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### 1. Setting Dimensions

- Define the size of your vector space in the dimensions input fields.
- As the grid automatically generates. Enter the number of components per vector and the vectors you wish to input.

**Gram-Schmidt Calculator**  
Orthogonalize a set of vectors in Euclidean space  $\mathbb{R}^n$  using the Gram-Schmidt process. Provides an orthonormal basis if inputs are linearly independent.

**Input Vectors**

DIMENSIONS  x  [Define 3 vectors in  \$\mathbb{R}^4\$](#)

v1	v2	v3
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

[Compute Basis](#)

**Results of Recent Calculations**

No calculation history yet


**Did you know?**

The Gram-Schmidt process takes a finite, linearly independent set of vectors  $S = \{v_1, v_2, \dots, v_k\}$  and generates an orthogonal set  $S' = \{u_1, u_2, \dots, u_k\}$  that spans the same  $k$ -dimensional subspace of  $\mathbb{R}^n$ .

### 2. Entering Vector Data

- Once the dimensions are set, you could input your vector data into the table generated
- Click into each cell under the column labels  $v^1$ ,  $v^2$ , ...,  $v^n$  and type the numerical value for that vector.

**Note:** A single vector is presented by a column and labeled as  $v^1$ ,  $v^2$ , and so on... Ensure you are entering data vertically.



## Gram-Schmidt Calculator

Orthogonalize a set of vectors in Euclidean space  $\mathbb{R}^n$  using the Gram-Schmidt process. Provides an orthonormal basis if inputs are linearly independent.

**Input Vectors**

DIMENSIONS  x  Define 3 vectors in  $\mathbb{R}^4$

v1	v2	v3
1	2	1
2	2	1
-1	0	1
0	1	0

Compute Basis

**Results of Recent Calculations**

No calculation history yet


---

**Did you know?**

The Gram-Schmidt process takes a finite, linearly independent set of vectors  $S = \{v_1, v_2, \dots, v_k\}$  and generates an orthogonal set  $S' = \{u_1, u_2, \dots, u_k\}$  that spans the same  $k$ -dimensional subspace of  $\mathbb{R}^n$ .

### 3. Computing the Basis

- Once all vector components are entered, click Compute Basis to start the calculation.



## Gram-Schmidt Calculator

Orthogonalize a set of vectors in Euclidean space  $\mathbb{R}^n$  using the Gram-Schmidt process. Provides an orthonormal basis if inputs are linearly independent.

**Input Vectors**

DIMENSIONS  x  Define 3 vectors in  $\mathbb{R}^4$

v1	v2	v3
1	2	1
2	2	1
-1	0	1
0	1	0

Compute Basis

**Results of Recent Calculations**

No calculation history yet


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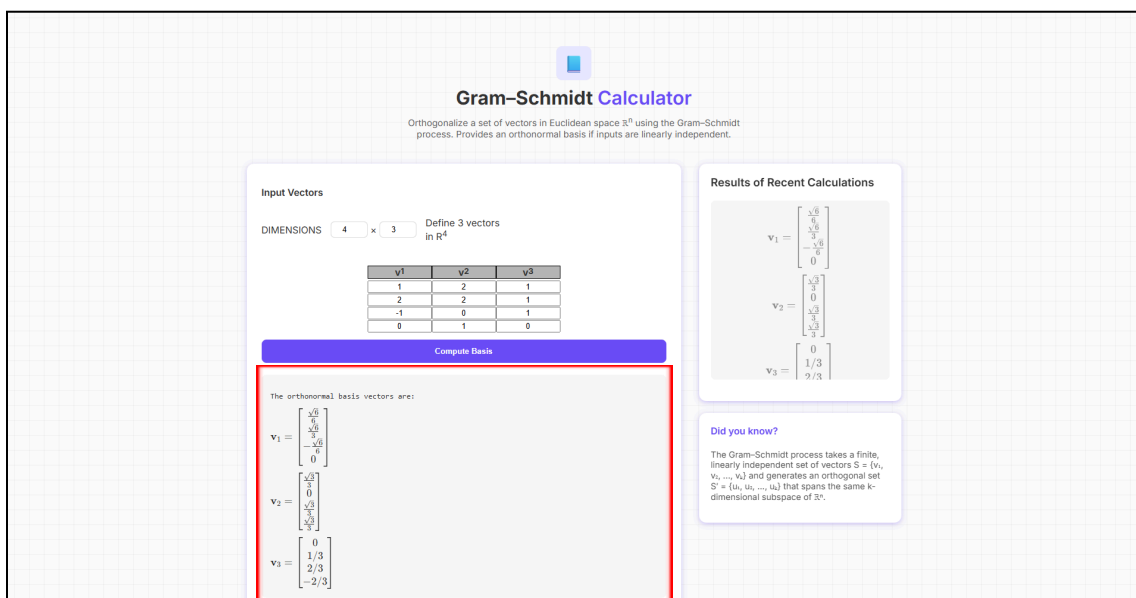
**Did you know?**

The Gram-Schmidt process takes a finite, linearly independent set of vectors  $S = \{v_1, v_2, \dots, v_k\}$  and generates an orthogonal set  $S' = \{u_1, u_2, \dots, u_k\}$  that spans the same  $k$ -dimensional subspace of  $\mathbb{R}^n$ .

## 4. Output

- After the computation, the result will appear on the bottom of the input area and one of the following results will appear.

**Success** : If the vectors are linearly independent, it will display the orthonormal basis of each given vector.




The screenshot shows the "Gram-Schmidt Calculator" interface. The "Input Vectors" section has "DIMENSIONS" set to 4 x 3 and "Define 3 vectors in R<sup>4</sup>". A table shows the input vectors v<sup>1</sup>, v<sup>2</sup>, and v<sup>3</sup>:

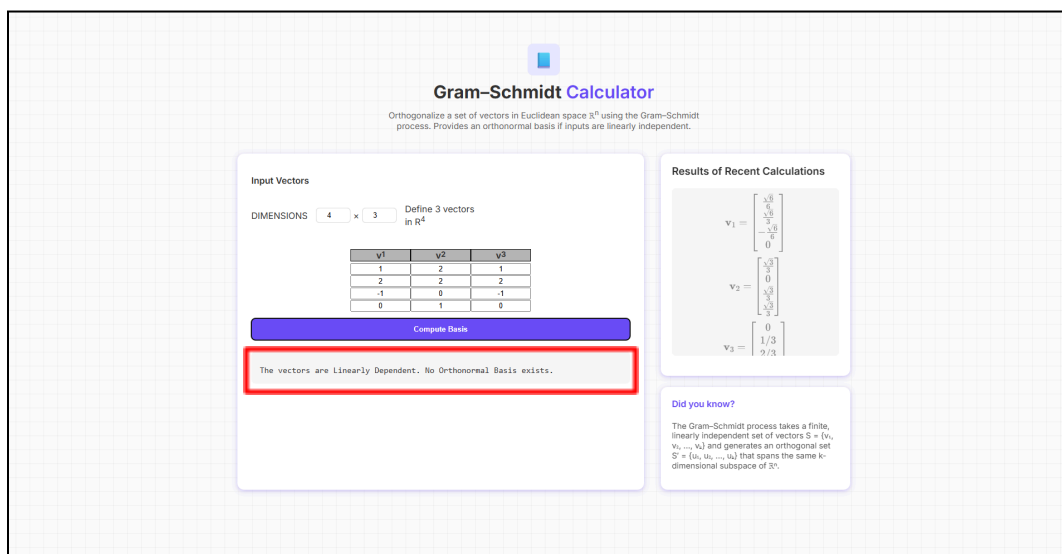
v <sup>1</sup>	v <sup>2</sup>	v <sup>3</sup>
1	2	1
2	2	1
-1	0	1
0	1	0

Below the table is a "Compute Basis" button. The output area, highlighted with a red border, displays the orthonormal basis vectors:

$$\mathbf{v}_1 = \begin{bmatrix} \frac{\sqrt{6}}{6} \\ \frac{\sqrt{6}}{6} \\ -\frac{\sqrt{6}}{6} \\ 0 \end{bmatrix}$$
$$\mathbf{v}_2 = \begin{bmatrix} \frac{\sqrt{2}}{2} \\ 0 \\ \frac{\sqrt{2}}{2} \\ \frac{\sqrt{2}}{2} \end{bmatrix}$$
$$\mathbf{v}_3 = \begin{bmatrix} 0 \\ 1/3 \\ 2/3 \\ -2/3 \end{bmatrix}$$

To the right, the "Results of Recent Calculations" section shows the same vectors v<sub>1</sub>, v<sub>2</sub>, and v<sub>3</sub> in a different format. Below that, a "Did you know?" box explains the Gram-Schmidt process.

**Error** : If the vectors are linearly dependent, it will display that the vectors are linearly dependent no orthonormal basis exists.



The screenshot shows the "Gram-Schmidt Calculator" interface with the same input as the previous one. However, the "Compute Basis" button is disabled. The output area, highlighted with a red border, displays the error message: "The vectors are Linearly Dependent. No Orthonormal Basis exists."