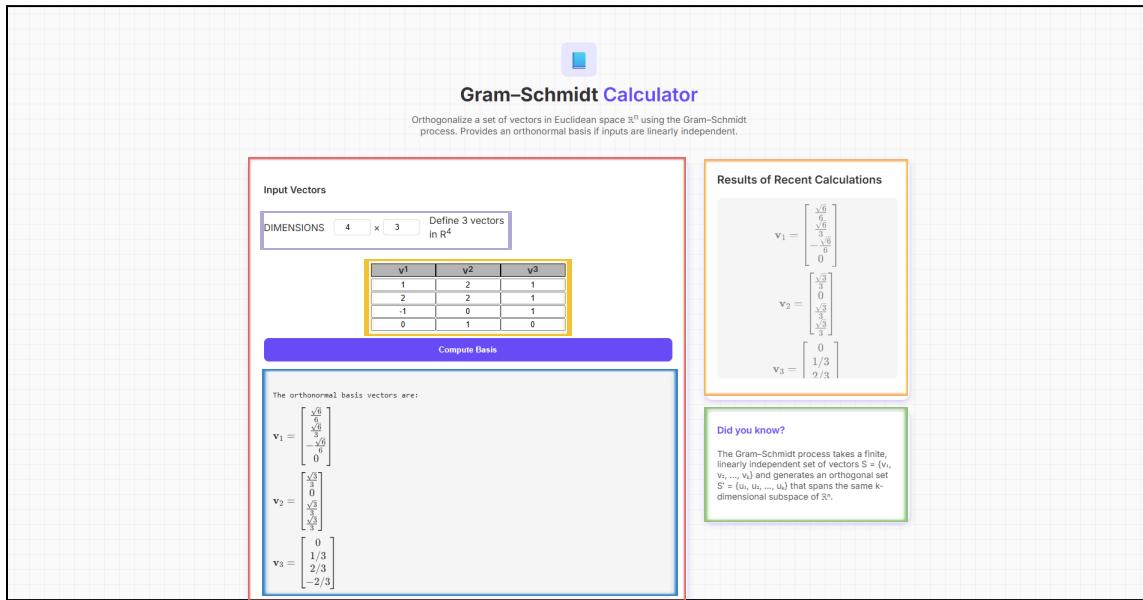


DOCUMENTATION

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.

Step-by-Step Operation:

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.

The screenshot shows the 'Gram-Schmidt Calculator' interface. At the top, it says '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.' Below this is the 'Input Vectors' section. It has a 'DIMENSIONS' input field containing '4 x 3' with a note 'Define 3 vectors in \mathbb{R}^4 ' highlighted by a red box. Below this is a table with columns labeled v1, v2, v3 and rows for vector components. A 'Compute Basis' button is at the bottom of this section. To the right is a 'Results of Recent Calculations' box stating 'No calculation history yet'. Below that is a 'Did you know?' box with text about the Gram-Schmidt process.

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, \dots, 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.

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Compute Basis

Results of Recent Calculations

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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. In the 'Input Vectors' section, three vectors v_1, v_2, v_3 are defined in \mathbb{R}^4 as follows:

v_1	v_2	v_3
1	2	1
2	2	1
-1	0	1
0	1	0

A blue 'Compute Basis' button is visible below the input table. To the right, under 'Results of Recent Calculations', the orthonormal basis vectors are shown:

$$v_1 = \begin{bmatrix} \frac{\sqrt{6}}{6} \\ \frac{\sqrt{6}}{6} \\ \frac{\sqrt{6}}{6} \\ 0 \end{bmatrix}$$

$$v_2 = \begin{bmatrix} \frac{\sqrt{3}}{3} \\ 0 \\ \frac{\sqrt{3}}{3} \\ \frac{\sqrt{3}}{3} \end{bmatrix}$$

$$v_3 = \begin{bmatrix} 0 \\ 1/3 \\ 2/3 \\ -2/3 \end{bmatrix}$$

A red box highlights the text 'The orthonormal basis vectors are:' and the resulting basis vectors.

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

The screenshot shows the same calculator interface. The input vectors remain the same as in the previous successful case. However, the output area now contains a red box with the message: 'The vectors are Linearly Dependent. No Orthonormal Basis exists.' This indicates that the calculator has determined the input vectors are linearly dependent and therefore cannot find an orthonormal basis.