

horizontal shear linear algebra

horizontal shear linear algebra is a fundamental concept in the field of linear algebra, particularly relevant in understanding transformations and their applications in various scientific and engineering domains. This article delves into the principles of horizontal shear, its mathematical formulation, applications, and significance in vector spaces. By exploring the properties of shear transformations, we will uncover how they affect geometric figures and data sets in practical scenarios. The discussion will also touch on related concepts such as matrix representation and eigenvalues, to provide a holistic view of horizontal shear in linear algebra.

- Introduction to Horizontal Shear
- Mathematical Representation of Shear Transformations
- Properties of Horizontal Shear
- Applications of Horizontal Shear in Various Fields
- Conclusion

Introduction to Horizontal Shear

Horizontal shear is a type of linear transformation that alters the shape of an object without changing its area. In the context of linear algebra, a shear transformation can be represented through matrices, which manipulate geometric figures effectively. Horizontal shear specifically refers to changes that occur along the x-axis, where points are displaced horizontally based on their vertical position. Understanding horizontal shear is crucial for applications in graphics, engineering, and physics, where transformations are routinely applied to model real-world scenarios.

The concept of shear can be visualized by imagining a stack of cards being pushed to one side while remaining fixed at the bottom. This transformation can be mathematically expressed using matrices, which allows for efficient computation and analysis. In the following sections, we will explore the mathematical representation of horizontal shear, its properties, and various applications that highlight its importance in both theoretical and practical contexts.

Mathematical Representation of Shear Transformations

Matrix Formulation of Horizontal Shear

In linear algebra, transformations can be represented using matrices. A horizontal shear transformation can be described by the following matrix:

$$S = \begin{bmatrix} 1 & k \\ 0 & 1 \end{bmatrix}$$

In this matrix, k represents the shear factor, which determines the degree of the transformation. When this matrix is applied to a vector $\mathbf{v} = [x, y]$, the resulting vector $\mathbf{v}' = S \mathbf{v}$ is transformed as follows:

$$\mathbf{v}' = [x + ky, y]$$

This formula illustrates how the y-coordinate influences the displacement along the x-axis. As the shear factor increases, the transformation becomes more pronounced, leading to a more significant distortion of the original figure.

Visual Interpretation of Shear

Visualizing horizontal shear can enhance understanding. Consider a rectangle positioned in a coordinate plane. When subjected to horizontal shear, the top corners of the rectangle move horizontally while the bottom corners remain fixed. This results in a parallelogram shape, demonstrating how horizontal shear alters geometric figures without changing their area.

For example, if we apply a horizontal shear with a shear factor of 2 to a rectangle defined by the vertices $(0, 0)$, $(2, 0)$, $(2, 1)$, and $(0, 1)$, the new vertices will be transformed to $(0, 0)$, $(2, 0)$, $(4, 1)$, and $(2, 1)$. This transformation can be graphically represented to show the effect of the shear on the original shape.

Properties of Horizontal Shear

Key Characteristics

Horizontal shear transformations possess several important properties that are vital for understanding their behavior:

- **Linearity:** Shear transformations are linear, meaning they preserve vector addition and scalar multiplication.
- **Area Preservation:** Despite altering the shape, horizontal shear does not change the area of geometric figures.
- **Invertibility:** The inverse of a shear transformation can be calculated, allowing for the recovery of the original shape.

Eigenvalues and Eigenvectors

Another significant aspect of horizontal shear is its relationship with eigenvalues and eigenvectors. The eigenvalues of the shear matrix **S** are essential for understanding the transformation's effects on vectors. For a horizontal shear matrix:

$$\lambda_1 = 1, \lambda_2 = 1$$

Both eigenvalues being equal indicates that the transformation does not expand or contract the space, but rather distorts it. The eigenvectors associated with these eigenvalues provide insight into the directions that remain unchanged during the transformation.

Applications of Horizontal Shear in Various Fields

Computer Graphics

In computer graphics, horizontal shear is frequently used for creating dynamic effects and animations. By applying shear transformations to objects, developers can achieve realistic motion and perspective. This is particularly useful in video games and simulations, where visual effects can enhance user experience.

Structural Engineering

In structural engineering, understanding shear forces is crucial for designing stable structures. Horizontal shear analysis helps engineers determine how loads affect beams and other structural elements, enabling them to create safer and more efficient designs.

Data Analysis

In data analysis, horizontal shear can be applied to visualizations when transforming datasets. For example, it can help in adjusting scatter plots or histograms to reveal trends and patterns that might not be apparent in their original form. This aids in better decision-making based on visual data representation.

Conclusion

Horizontal shear linear algebra is a significant concept that bridges theoretical mathematics with practical applications across various fields. By understanding its mathematical representation and properties, one can appreciate its utility in shaping objects and analyzing data. The ability to manipulate geometric figures through shear transformations enhances the modeling capabilities in computer graphics, structural engineering, and data analysis. As technology continues to advance, the relevance of horizontal shear in linear algebra will undoubtedly grow, further highlighting its importance in both academic research and real-world applications.

Q: What is horizontal shear in linear algebra?

A: Horizontal shear in linear algebra refers to a linear transformation that displaces points in a geometric figure along the x-axis based on their y-coordinates. It is represented by a specific matrix and preserves the area of the figure while altering its shape.

Q: How is horizontal shear represented mathematically?

A: Horizontal shear is mathematically represented using a 2x2 matrix of the form $\begin{bmatrix} 1 & k \\ 0 & 1 \end{bmatrix}$, where k is the shear factor. This matrix transforms a vector by adding a multiple of its y-coordinate to its x-coordinate.

Q: What are the main properties of horizontal shear?

A: The main properties of horizontal shear include linearity, area preservation, and invertibility. It also has eigenvalues that indicate the nature of the transformation.

Q: Where is horizontal shear applied in real life?

A: Horizontal shear is applied in various fields such as computer graphics for animations, structural engineering for analyzing shear forces, and data analysis for transforming datasets in visual representations.

Q: Can horizontal shear be inverted?

A: Yes, horizontal shear transformations are invertible. The inverse transformation can recover the original geometric figure from its sheared state.

Q: What is the significance of eigenvalues in horizontal shear?

A: Eigenvalues in horizontal shear indicate the scale of transformation. In shear transformations, they typically show that the space is not expanded or contracted but distorted, which is crucial for understanding the behavior of the transformation.

Q: How does horizontal shear affect a rectangle?

A: When horizontal shear is applied to a rectangle, the shape transforms into a parallelogram, with the top corners moving horizontally based on their vertical positions, while the bottom corners remain fixed.

Q: What is the geometric interpretation of horizontal shear?

A: Geometrically, horizontal shear can be visualized as pushing the top of a shape sideways while keeping the base fixed, resulting in a slanted shape that retains its area.

Q: Is horizontal shear used in machine learning?

A: Yes, horizontal shear can be utilized in machine learning for data preprocessing and visualization, helping to adjust datasets for better

pattern recognition and analysis.

Horizontal Shear Linear Algebra

Find other PDF articles:

<https://explore.gcts.edu/workbooks-suggest-001/Book?dataid=LCb83-0107&title=algebra-workbooks-pdf.pdf>

horizontal shear linear algebra: Essential Linear Algebra Jared M. Maruskin, 2012-12 This text introduces linear algebra--boiled to its essence--presented in a clear and concise fashion. Designed around a single-semester undergraduate course, Essential Linear Algebra introduces key concepts, various real-world applications, and provides detailed yet understandable proofs of key results that are aimed towards students with no advanced preparation in proof writing. The level of sophistication gradually increases from beginning to end in order to prepare students for subsequent studies. We begin with a detailed introduction to systems of linear equations and elementary row operations. We then advance to a discussion of linear transformations, which provide a second, more geometric, interpretation of the operation of matrix-vector product. We go on to introduce vector spaces and their subspaces, the image and kernel of a transformation, and change of coordinates. Following, we discuss matrices of orthogonal projections and orthogonal matrices. Our penultimate chapter is devoted to the theory of determinants, which are presented, first, in terms of area and volume expansion factors of 2×2 and 3×3 matrices, respectively. We use a geometric understanding of volume in n -dimensions to introduce general determinants axiomatically as multilinear, antisymmetric mappings, and prove existence and uniqueness. Our final chapter is devoted to the theory of eigenvalues and eigenvectors. We conclude with a number of discussions on various types of diagonalization: real, complex, and orthogonal.

horizontal shear linear algebra: Real Linear Algebra Antal E. Fekete, 1985-01-25

horizontal shear linear algebra: Linear Algebra Michael L. O'Leary, 2021-05-04 LINEAR ALGEBRA EXPLORE A COMPREHENSIVE INTRODUCTORY TEXT IN LINEAR ALGEBRA WITH COMPELLING SUPPLEMENTARY MATERIALS, INCLUDING A COMPANION WEBSITE AND SOLUTIONS MANUALS Linear Algebra delivers a fulsome exploration of the central concepts in linear algebra, including multidimensional spaces, linear transformations, matrices, matrix algebra, determinants, vector spaces, subspaces, linear independence, basis, inner products, and eigenvectors. While the text provides challenging problems that engage readers in the mathematical theory of linear algebra, it is written in an accessible and simple-to-grasp fashion appropriate for junior undergraduate students. An emphasis on logic, set theory, and functions exists throughout the book, and these topics are introduced early to provide students with a foundation from which to attack the rest of the material in the text. Linear Algebra includes accompanying material in the form of a companion website that features solutions manuals for students and instructors. Finally, the concluding chapter in the book includes discussions of advanced topics like generalized eigenvectors, Schur's Lemma, Jordan canonical form, and quadratic forms. Readers will also benefit from the inclusion of: A thorough introduction to logic and set theory, as well as descriptions of functions and linear transformations An exploration of Euclidean spaces and linear transformations between Euclidean spaces, including vectors, vector algebra, orthogonality, the standard matrix, Gauss-Jordan elimination, inverses, and determinants Discussions of abstract vector spaces, including subspaces, linear independence, dimension, and change of basis A treatment on defining

geometries on vector spaces, including the Gram-Schmidt process Perfect for undergraduate students taking their first course in the subject matter, Linear Algebra will also earn a place in the libraries of researchers in computer science or statistics seeking an accessible and practical foundation in linear algebra.

horizontal shear linear algebra: *Introduction to Linear Algebra with Applications* Jim DeFranza, Daniel Gagliardi, 2015-01-23 Over the last few decades, linear algebra has become more relevant than ever. Applications have increased not only in quantity but also in diversity, with linear systems being used to solve problems in chemistry, engineering, economics, nutrition, urban planning, and more. DeFranza and Gagliardi introduce students to the topic in a clear, engaging, and easy-to-follow manner. Topics are developed fully before moving on to the next through a series of natural connections. The result is a solid introduction to linear algebra for undergraduates' first course.

horizontal shear linear algebra: *Linear Algebra and Analytic Geometry* Bennie Marsh & Frankie Murray, 2018-01-18 In this book, the topics are presented in the same order as in the textbook. The problems concern two content areas: Linear Algebra, and Analytical Geometry. After reading this book, a student should be able to solve linear equations and to perform the basic operations on numbers and algebraic expressions. The Linear Algebra tests will reveal readers' knowledge and skills, readers' abilities in interpreting symbols, justifying statements and constructing proofs. Readers should be able to apply the properties of determinants and matrix operations and solve linear systems of equations. The Analytical Geometry topics include different forms of equations of straight lines and planes; angles between simple figures; the curves of the second order. This book will prove definitive and ideal reference tool to research scholars, academicians and educationists.

horizontal shear linear algebra: *Linear Algebra and Its Applications* Mr. Rohit Manglik, 2024-07-18 EduGorilla Publication is a trusted name in the education sector, committed to empowering learners with high-quality study materials and resources. Specializing in competitive exams and academic support, EduGorilla provides comprehensive and well-structured content tailored to meet the needs of students across various streams and levels.

horizontal shear linear algebra: *Finite-Dimensional Linear Algebra* Mark S. Gockenbach, 2011-06-15 Linear algebra forms the basis for much of modern mathematics—theoretical, applied, and computational. Finite-Dimensional Linear Algebra provides a solid foundation for the study of advanced mathematics and discusses applications of linear algebra to such diverse areas as combinatorics, differential equations, optimization, and approximation. The author begins with an overview of the essential themes of the book: linear equations, best approximation, and diagonalization. He then takes students through an axiomatic development of vector spaces, linear operators, eigenvalues, norms, and inner products. In addition to discussing the special properties of symmetric matrices, he covers the Jordan canonical form, an important theoretical tool, and the singular value decomposition, a powerful tool for computation. The final chapters present introductions to numerical linear algebra and analysis in vector spaces, including a brief introduction to functional analysis (infinite-dimensional linear algebra). Drawing on material from the author's own course, this textbook gives students a strong theoretical understanding of linear algebra. It offers many illustrations of how linear algebra is used throughout mathematics.

horizontal shear linear algebra: *Fundamentals of Linear Algebra* J.S. Chahal, 2018-12-07 Fundamentals of Linear Algebra is like no other book on the subject. By following a natural and unified approach to the subject it has, in less than 250 pages, achieved a more complete coverage of the subject than books with more than twice as many pages. For example, the textbooks in use in the United States prove the existence of a basis only for finite dimensional vector spaces. This book proves it for any given vector space. With his experience in algebraic geometry and commutative algebra, the author defines the dimension of a vector space as its Krull dimension. By doing so, most of the facts about bases when the dimension is finite, are trivial consequences of this definition. To name one, the replacement theorem is no longer needed. It becomes obvious that any two bases of a

finite dimensional vector space contain the same number of vectors. Moreover, this definition of the dimension works equally well when the geometric objects are nonlinear. Features: Presents theories and applications in an attempt to raise expectations and outcomes The subject of linear algebra is presented over arbitrary fields Includes many non-trivial examples which address real-world problems

horizontal shear linear algebra: Linear Algebra Eugene A. Herman, 2001 New Interactive Linear Algebra Maple Modules. Linear Algebra: Modules for Interactive Learning Using Maple 6♦ is organized into a collection of twenty-nine extensive (and intensive) modules, which must be used in conjunction with Maple 6. Each module is divided into an interactive Tutorial followed by a rich and substantial collection of Problems. Linear Algebra: Modules for Interactive Learning Using Maple 6♦ has been carefully designed to help students develop their geometric intuition and deepen their understanding of linear algebra concepts and methods. These modules support both individual work and interactive collaboration. They can be used as a supplement in a traditional lecture course, or in a lab-only format. Due to the versatility of the modules, they can be easily adapted to a variety of curricula, institutions, and styles of teaching. The modules can be used on all the common hardware platforms Windows♦ PCs, Macintosh♦ computers, and Unix workstations.

horizontal shear linear algebra: Linear Algebra for Computational Sciences and Engineering Ferrante Neri, 2019-07-26 This book presents the main concepts of linear algebra from the viewpoint of applied scientists such as computer scientists and engineers, without compromising on mathematical rigor. Based on the idea that computational scientists and engineers need, in both research and professional life, an understanding of theoretical concepts of mathematics in order to be able to propose research advances and innovative solutions, every concept is thoroughly introduced and is accompanied by its informal interpretation. Furthermore, most of the theorems included are first rigorously proved and then shown in practice by a numerical example. When appropriate, topics are presented also by means of pseudocodes, thus highlighting the computer implementation of algebraic theory. It is structured to be accessible to everybody, from students of pure mathematics who are approaching algebra for the first time to researchers and graduate students in applied sciences who need a theoretical manual of algebra to successfully perform their research. Most importantly, this book is designed to be ideal for both theoretical and practical minds and to offer to both alternative and complementary perspectives to study and understand linear algebra.

horizontal shear linear algebra: Linear Algebra for Earth Scientists J. Douglas Walker, Noah M. McLean, 2024-04-22 Linear Algebra for Earth Scientists is written for undergraduate and graduate students in Earth and Environmental sciences. It is intended to give students enough background in linear algebra to work with systems of equations and data in geology, hydrology, geophysics, or whatever part of the Earth Sciences they engage with. The book does not presuppose any extensive prior knowledge of linear algebra. Instead, the book builds students up from a low base to a working understanding of the sub t that they can apply to their work, using many familiar examples in the geosciences. Features Suitable for students of Earth and Environmental Sciences Minimal prerequisites — written in a way that is accessible and engaging for those without a mathematical background All material presented with examples and applications to the Earth Sciences

horizontal shear linear algebra: Numerical Methods Anne Greenbaum, Tim P. Chartier, 2012-04 Designed for upper-division undergraduates in mathematics or computer science classes, the textbook assumes that students have prior knowledge of linear algebra and calculus, although these topics are reviewed in the text. Short discussions of the history of numerical methods are interspersed throughout the chapters. The book also includes polynomial interpolation at Chebyshev points, use of the MATLAB package Chebfun, and a section on the fast Fourier transform. Supplementary materials are available online.

horizontal shear linear algebra: Linear Algebra Elliott Ward Cheney, David Ronald Kincaid, 2009 Systems of linear equations -- Vector spaces -- Matrix operations -- Determinants -- Vector

subspaces -- Eigensystems -- Inner-product vector spaces -- Additional topics.

horizontal shear linear algebra: *A Course in Linear Algebra* Raju K. George, Abhijith Ajayakumar, 2024-02-27 Designed for senior undergraduate and graduate courses in mathematics and engineering, this self-contained textbook discusses key topics in linear algebra with real-life applications. Split into two parts—theory in part I and solved problems in part II—the book makes both theoretical and applied linear algebra easily accessible. Topics such as sets and functions, vector spaces, linear transformations, eigenvalues and eigenvectors, normed spaces, and inner product spaces are discussed in part I; while in part II, over 500 meticulously solved problems show how to use linear algebra in real-life situations. A must-have book for linear algebra courses; it also serves as valuable supplementary material.

horizontal shear linear algebra: *Elementary Linear Algebra* John A. Thorpe, Paul G. Kumpel, 1984

horizontal shear linear algebra: *Algebra-I* Rajendra Kumar Sharma, 2011 Algebra is a compulsory paper offered to the undergraduate students of Mathematics. The majority of universities offer the subject as a two /three year paper or in two/three semesters. Algebra I: A Basic Course in Abstract Algebra covers the topic required for a basic course.

horizontal shear linear algebra: *Mechanics of Solids* Carl Ross, John Bird, Andrew Little, 2021-11-01 Mechanics of Solids provides an introduction to the behaviour of solid materials under various loading conditions, focusing upon the fundamental concepts and principles of statics and stress analysis. As the primary recommended text of the Council of Engineering Institutions for university undergraduates studying mechanics of solids it is essential reading for mechanical engineering undergraduates and also students on many civil, structural, aeronautical and other engineering courses. The mathematics in this book has been kept as straightforward as possible and worked examples are used to reinforce key concepts. Practical stress and strain scenarios are covered, including simple stress and strain, torsion, bending, elastic failure and buckling. Many examples are given of thin-walled structures, beams, struts and composite structures. This third edition includes new chapters on matrix algebra, linear elastic fracture mechanics, material property considerations and more on strain energy methods. The companion website www.routledge.com/cw/bird provides full solutions to all 575 further problems in the text, multiple-choice tests, a list of essential formulae, resources for adopting course instructors, together with several practical demonstrations by Professor Ross.

horizontal shear linear algebra: *Introduction to Linear Algebra in Geology* John Ferguson, 1994-05-31 Introduction to Linear Algebra in Geology introduces linear algebra to students of geology and explores the possibilities of using the techniques as an aid to solving geological problems which can be solved numerically. A basic knowledge of geology is assumed.

horizontal shear linear algebra: *Linear Algebra with Mathematica* Fred Szabo, 2000-02-14 Linear Algebra: An Introduction With Mathematica uses a matrix-based presentation and covers the standard topics any mathematician will need to understand linear algebra while using Mathematica. Development of analytical and computational skills is emphasized, and worked examples provide step-by-step methods for solving basic problems using Mathematica. The subject's rich pertinence to problem solving across disciplines is illustrated with applications in engineering, the natural sciences, computer animation, and statistics. Includes a thematic presentation of linear algebra Provides a systematic integration of Mathematica Encourages students to appreciate the benefits of mathematical rigor All exercises can be solved with Mathematica

horizontal shear linear algebra: *Practical Linear Algebra* Gerald Farin, Dianne Hansford, 2021-10-12 Linear algebra is growing in importance. 3D entertainment, animations in movies and video games are developed using linear algebra. Animated characters are generated using equations straight out of this book. Linear algebra is used to extract knowledge from the massive amounts of data generated from modern technology. The Fourth Edition of this popular text introduces linear algebra in a comprehensive, geometric, and algorithmic way. The authors start with the fundamentals in 2D and 3D, then move on to higher dimensions, expanding on the fundamentals and

introducing new topics, which are necessary for many real-life applications and the development of abstract thought. Applications are introduced to motivate topics. The subtitle, *A Geometry Toolbox*, hints at the book's geometric approach, which is supported by many sketches and figures. Furthermore, the book covers applications of triangles, polygons, conics, and curves. Examples demonstrate each topic in action. This practical approach to a linear algebra course, whether through classroom instruction or self-study, is unique to this book. New to the Fourth Edition: Ten new application sections. A new section on change of basis. This concept now appears in several places. Chapters 14-16 on higher dimensions are notably revised. A deeper look at polynomials in the gallery of spaces. Introduces the QR decomposition and its relevance to least squares. Similarity and diagonalization are given more attention, as are eigenfunctions. A longer thread on least squares, running from orthogonal projections to a solution via SVD and the pseudoinverse. More applications for PCA have been added. More examples, exercises, and more on the kernel and general linear spaces. A list of applications has been added in Appendix A. The book gives instructors the option of tailoring the course for the primary interests of their students: mathematics, engineering, science, computer graphics, and geometric modeling.

Related to horizontal shear linear algebra

Horizontal | Weblio horizontal - Weblio

horizon | Weblio 3 4 5 6 spatial

horizontally | **Weblio** (in a horizontal direction) a gallery quite often is added to make use of space vertically as well as horizontally

horizontal position | **Weblio** horizontal position - 487

Weblio horizontal, side, lateral horizontal horizontal
horizontal

vertical | **Weblio** verˈtiːkəl / v'ɜːtɪk (ə)l v'ə:- / 1 垂直; 垂直 (cf. horizontal). vertical takeoff

axis | **Weblio** A directional vector that can be used to specify a position in space. The horizontal axis x-axis, the vertical y-axis, and near-to-far z-axis are used for three-dimensional graphing

Weblio - Weblio horizontal direction - 1000 Weblio Weblio

vertical, horizontal, and diagonal | **Weblio** vertical, horizontal, and diagonal
 - Weblio

lateral | **Weblio** 3 the side of something 4 horizontal 5 the side —the flank 6

Horizontal | Weblio horizontal -
 Weblio

horizon | Weblio 3 4 5 6 spatial

■■■■**horizontally**■■■■■■■■■■■■■■■■■■■■ | **Weblio**■■■■ (in a horizontal direction) a gallery quite often is added to make use of space vertically as well as horizontally ■■ ■■■ ■■■ ■■ ■■■■■ ■■■ ■ ■■■■■ ■ ■■■■■ ■■■■■

horizontal position | **Weblio** horizontal position - 487

Weblio horizontal, side, lateral horizontal horizontal
horizontal

vertical | **Weblio** verˈtiːkəl / v'ɜːtɪk (ə)l v'ə:- 1 垂直; 垂直 (cf. horizontal). vertical takeoff

axis | **Weblio** A directional vector that can be used to specify a position in

space. The horizontal axis x-axis, the vertical y-axis, and near-to-far z-axis are used for three-dimensional graphing

horizontal direction - 1000 Weblio

vertical, horizontal, and diagonal Weblio

lateral Weblio 3 the side of something 4 horizontal 5 the side —the flank 6

horizontal Weblio horizontal - Weblio

horizon Weblio 3 periphery 4 horizontal 5 spatial 6

horizontally Weblio (in a horizontal direction) a gallery quite often is added to make use of space vertically as well as horizontally

horizontal position Weblio horizontal position - 487

horizontal, side, lateral horizontal horizontal Weblio

vertical Weblio verˈtiːkəl / v'əːˌtɪk (ə)l v'əː- / 1 (cf. horizontal). vertical takeoff

axis Weblio A directional vector that can be used to specify a position in space. The horizontal axis x-axis, the vertical y-axis, and near-to-far z-axis are used for three-dimensional graphing

horizontal direction - 1000 Weblio

vertical, horizontal, and diagonal Weblio vertical, horizontal, and diagonal

lateral Weblio 3 the side of something 4 horizontal 5 the side —the flank 6

horizontal Weblio horizontal - Weblio

horizon Weblio 3 periphery 4 horizontal 5 spatial 6

horizontally Weblio (in a horizontal direction) a gallery quite often is added to make use of space vertically as well as horizontally

horizontal position Weblio horizontal position - 487

horizontal, side, lateral horizontal horizontal Weblio

vertical Weblio verˈtiːkəl / v'əːˌtɪk (ə)l v'əː- / 1 (cf. horizontal). vertical takeoff

axis Weblio A directional vector that can be used to specify a position in space. The horizontal axis x-axis, the vertical y-axis, and near-to-far z-axis are used for three-dimensional graphing

horizontal direction - 1000 Weblio

vertical, horizontal, and diagonal Weblio vertical, horizontal, and diagonal

lateral Weblio 3 the side of something 4 horizontal 5 the side —the flank 6

Back to Home: <https://explore.gcts.edu>