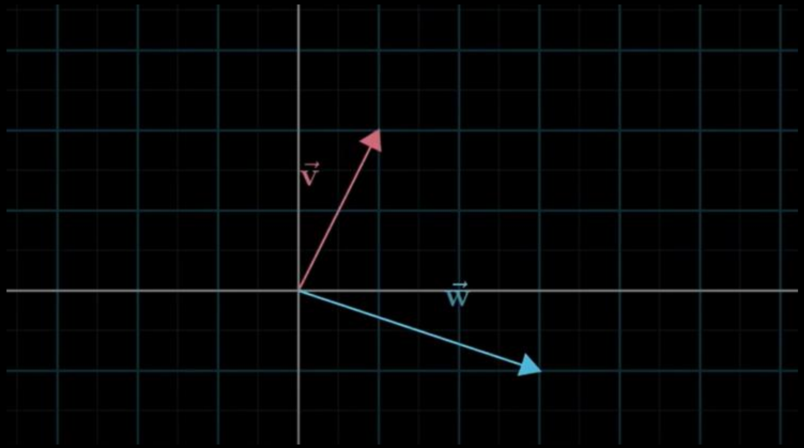
Week 3 - MATH1012 Practical

This Week: Subspaces & Span



Sets of Vectors: e.g. {(0,1),(1,0)}, {(1,2),(3,-1)}, {(0.5,0,1),(1,2,3),(2,4,7)}

Linear Combination: Some scaling/addition of a set of vectors: $a\vec{\mathbf{v}} + b\vec{\mathbf{w}}$

Span: The set of all possible Linear Combination's

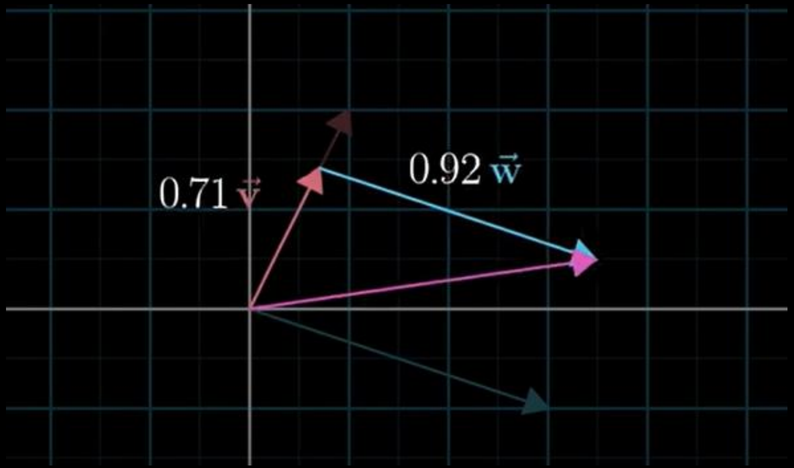
Spanning Set of a (Vector) Space V: Set of vectors which spans the space V.

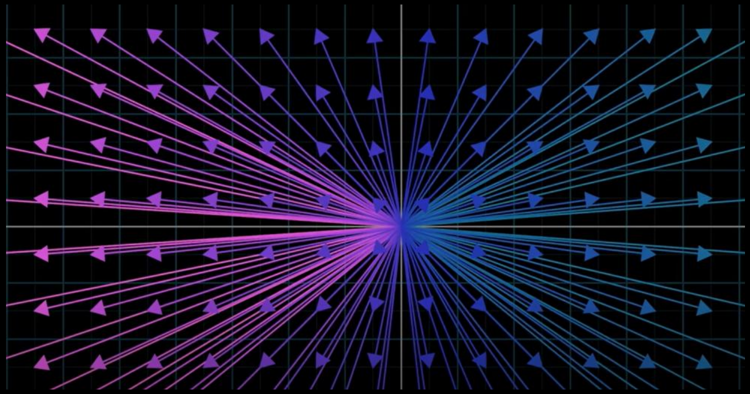
Basis (of V): Minimal Spanning Set (Vectors which spans V with redundant vectors removed).

Linearly Independent: A set of vector's where each vector cannot be described as a linear combination of other vectors.

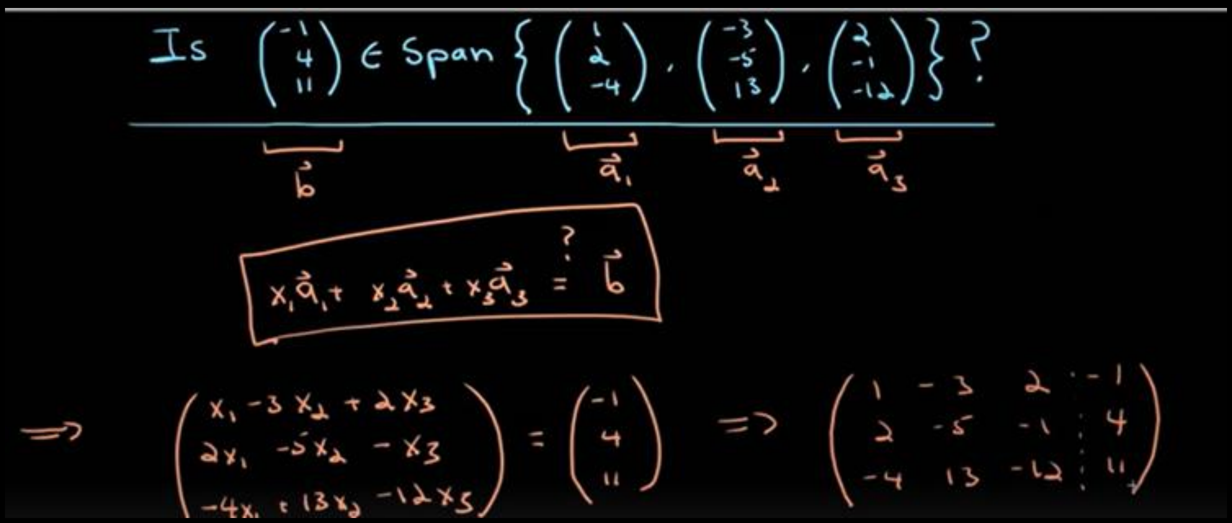
Linearly Independent

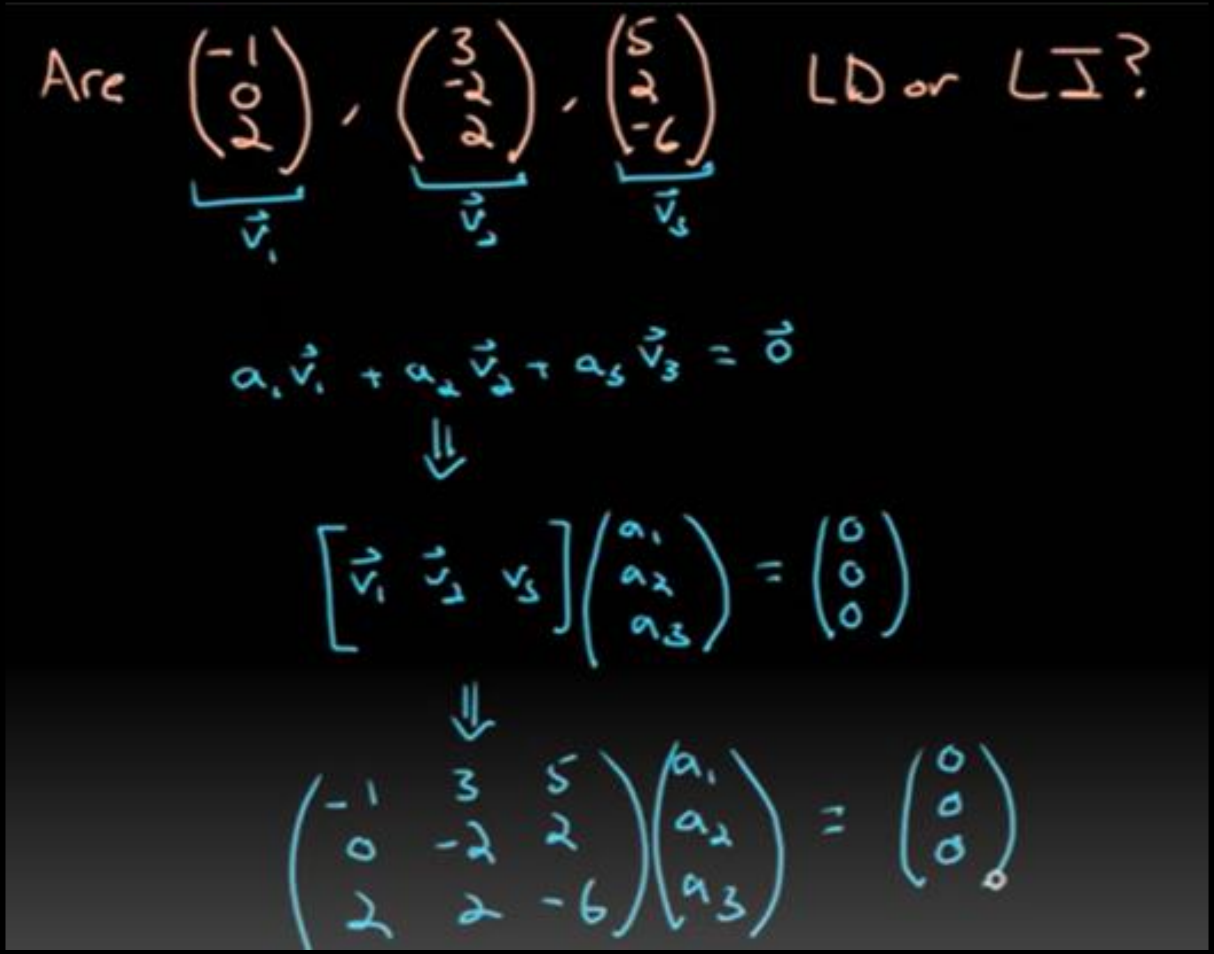
if: $a_1\mathbf{v}_1 + a_2\mathbf{v}_2 + \cdots + a_k\mathbf{v}_k = \mathbf{0}$ When only v_1 v_2, ... v_3 = 0





Determining Linear Independence/Span





This Week: Subspaces & Span.

Subspace – subsets of a Vector Space which can behave as its own vector space.

Three Axioms:

(1) – Contains the Zero Vector

(2) - Closed under Scalar Multiplication

(3) - Closed under Addition

In Euclidean Space, this means that subspaces are going to be points, lines, planes, hyperplanes, et. cetera through the origin.

Summary for the week

Linear Combination: Some scaling/addition of a set of vectors:

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if: $$a_1\mathbf{v}_1 + a_2\mathbf{v}_2 + \cdots + a_k\mathbf{v}_k = \mathbf{0}$$ When only v_1 v_2, ... v_3 = 0

Subspaces:

(1) – Contains the Zero Vector

(2) - Closed under Scalar Multiplication

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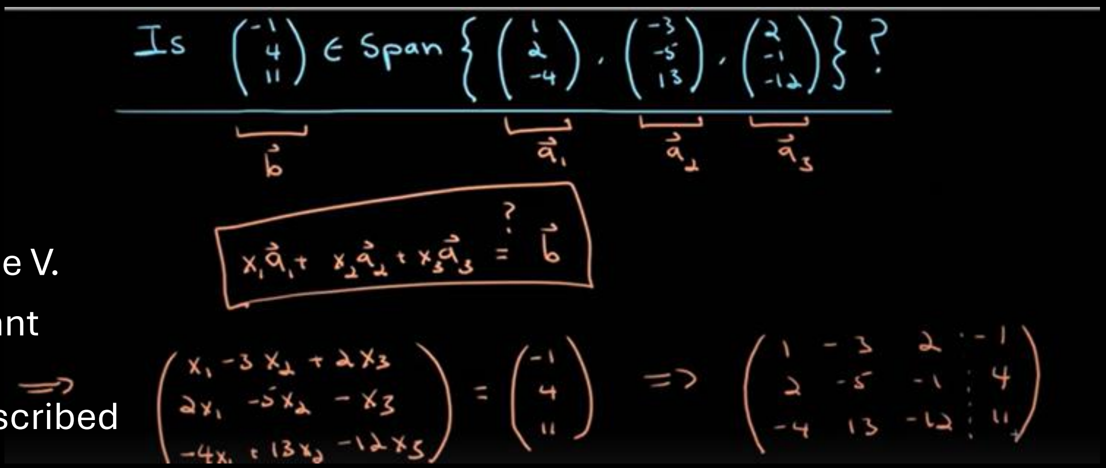
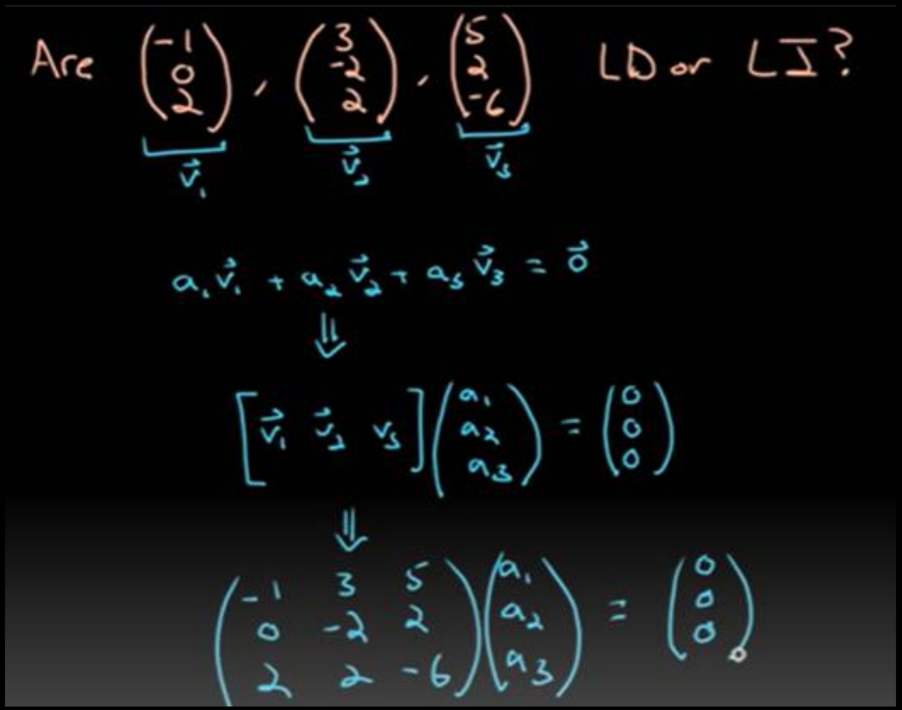
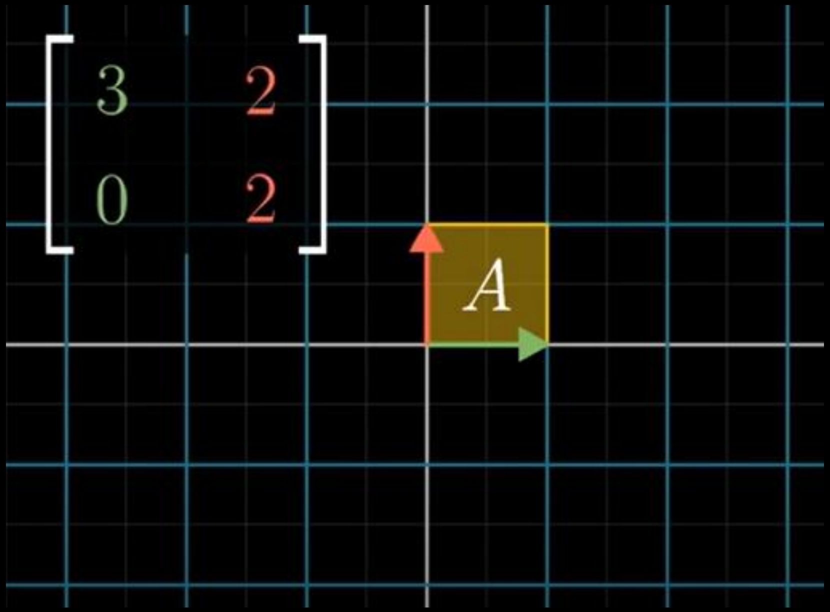
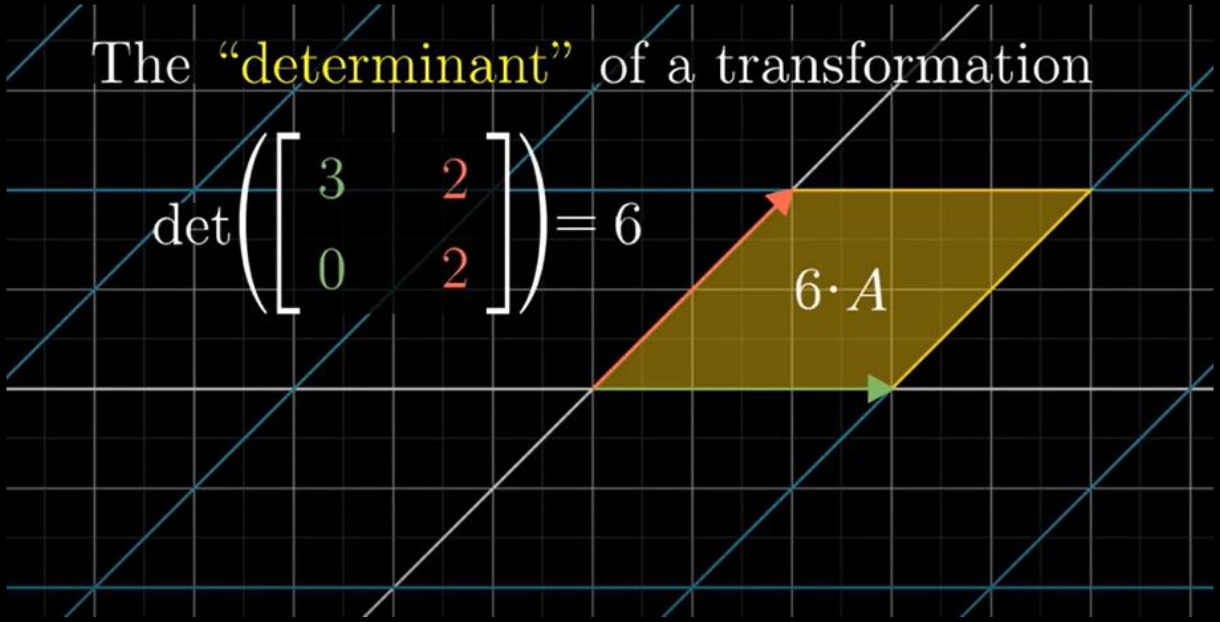




Determinant: ~Change in Area/Volume under a matrix/transformation.

Linearly Dependence: Det A = 0





Sources

Images:

3Blue1Brown/Grant Sanderson - Slide 2, 6

Trefor Bazett – Slide 3,5