Linear Algebra Playlist

For each question, mark all that apply

Video #0 - Intro

1. For the following, mark each one as being more strongly related to either the ***geometric (g)*** or ***numerical (n)*** aspect of linear algebra.

1. A way to judge what tools to use to solve specific problems **(g)**
2. Get a feeling or intuition about why something works **(g)**
3. Actually carrying out the operations **(n)**
4. Know how to interpret the results of particular operations **(g)**

Video #1: Vectors, what even are they?

2. Mark each one of the following as either ***physicist’s***, ***mathematician’s***, or ***computer scientist’s*** perspective:

1. Ordered lists of numbers computer **scientist’s**
2. Arrows pointing in space **physicist’s**
3. Anything where there’s a sensible notion of addition and multiplication by a number **mathematician’s**

3. The video gives 2 characteristics for the origin of a coordinate system in terms of linear algebra. What are they?

The origin is the center of space and the root of all vectors.

4. The numeric components of a vector can be seen as instructions that tell you how to get from its tail to its tip. How does the video explain this with respect to the coordinate system axes?

The video explains this as using the top number to move along the x-axis, positive numbers move right and negative numbers move left. Then use the bottom number and move parallel to the y axis with positive numbers moving up and negative numbers moving down.

5. Using only the concepts of “tips” and “tails”, how does the video prescribe accomplishing the addition of 2 vectors?

In the video, you would the “tail” of the second vector to the “tip” of the first vector. Then you draw the new vector from the “tail” of the first vector to the “tip” of the second vector. This new vector is the sum of the two vectors.

6. Why is it reasonable to let a vector stray from the origin (such as is done in the answer to the previous question)?

Each vector represents a certain movement and so if you were to move along the first vector then move along the second vector, the end result is the same if you had moved along the sum of those two vectors.

Video #2 Linear Combination, Span, and Basis Vectors

7. What does it mean to be a basis vector?

Basis vectors are the set of vectors that are being scaled. They are arbitrary, having any length or direction, but are the vectors the operation will be affecting. If they are linearly independent, than every vector in the space is a linear combination of the set. The most common are j hat and i hat.

8. How can any vector be decomposed into a linear combination of basis vectors?

Any vector can be calculated as the sum of a nearly infinite set of multiple scaled basis vectors.

Given a vector or set of vectors, we can solve for many possible sets of basis vectors.

9. What is the span of a coordinate system with 2 basis vectors? What about 3?

The span of a coordinate system with 2 basis vectors is every possible point on that two dimensional plane as long as they are linearly independent. If there are 3 basis vectors, the span is every point in 3 dimensional space as long as all of the 3 vectors are linearly independent.

Closing thoughts on the purpose of this exercise:

Linear algebra gives us a language to describe and manipulate space using numbers that can be crunched and run through a computer. The tools that we learn and use in this class will be broadly applicable whether you are writing a system from scratch or using the tools provided by other graphical development tool (like game engines).