①

Eigenproblems: Special Eigen case

we stretched that Eigenvectors are those which lie on the same span before and after applying a linear transform to space

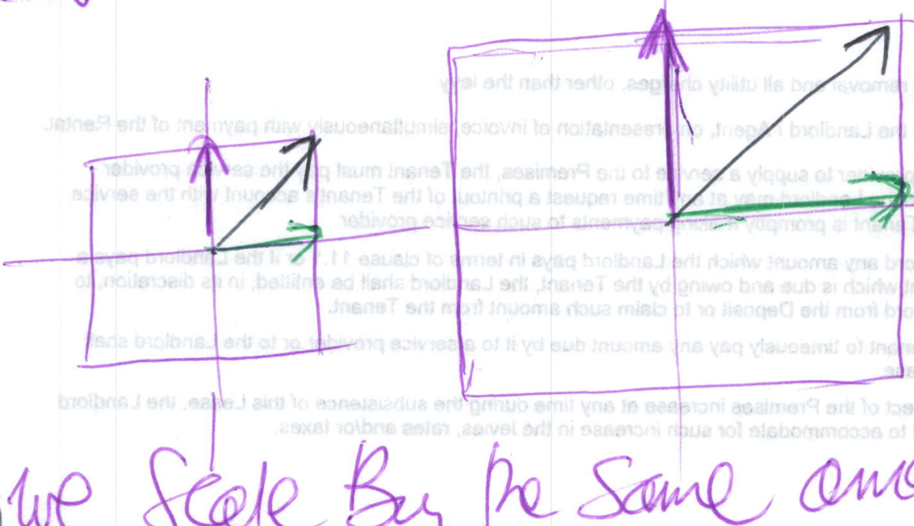
and Eigenvalue is simply the amount the vector of each of these vectors that has been stretched in process

We'll look at $\boxed{3 \text{ SPECIAL CASES}}$

in 2D to in 3D or more

Uniform SCALE

(2 Squares)

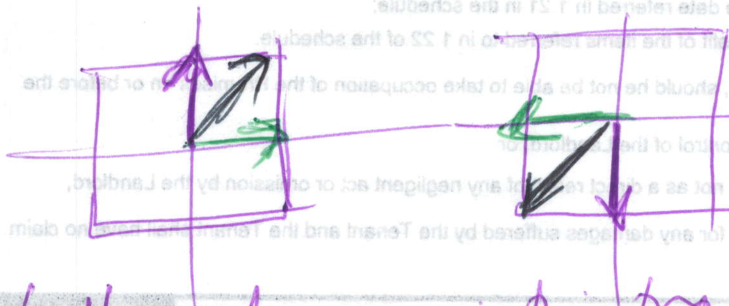


① we scale by the same amount in each direction.

②

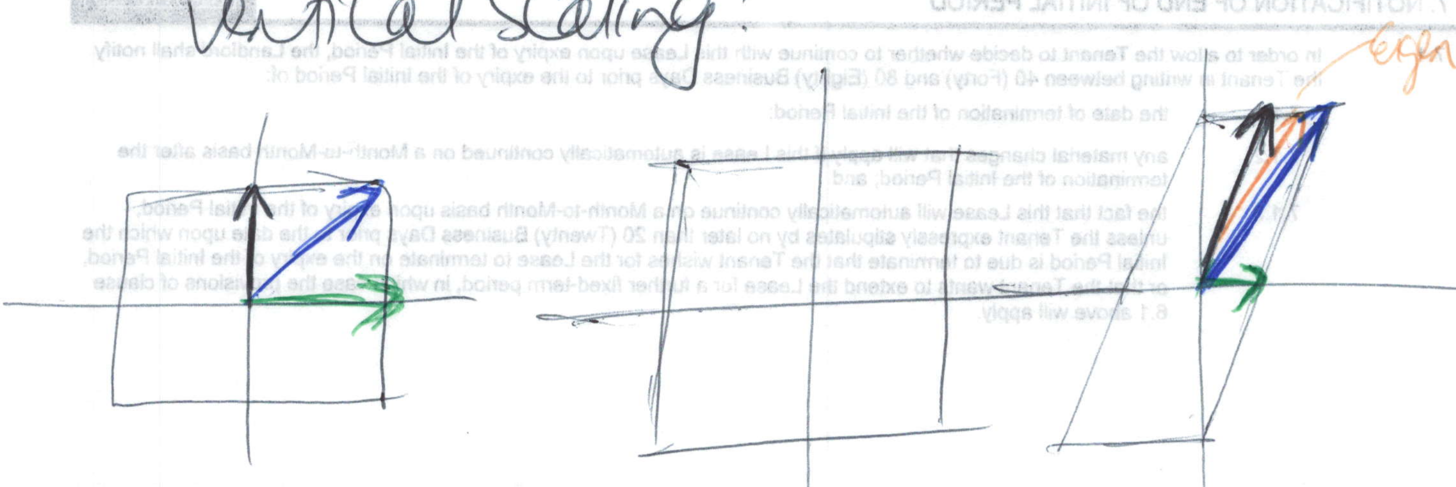
∴ any vector in this plane (after Reflection), is an eigenvector.

② Previously rotation did not produce any eigenvectors,
But the only eigenvector we get from rotation, will when we rotate 180°, they just in opposite direction.



Any/all vectors in this transform will be eigenvectors, and they all have eigenvalue −1

③ Combination of horizontal shear and vertical scaling:



Different from "pure" Shear earlier

Here:

7 As before with pure shear, green horizontal vector = Eigenvector, and Eigenvalue still 1

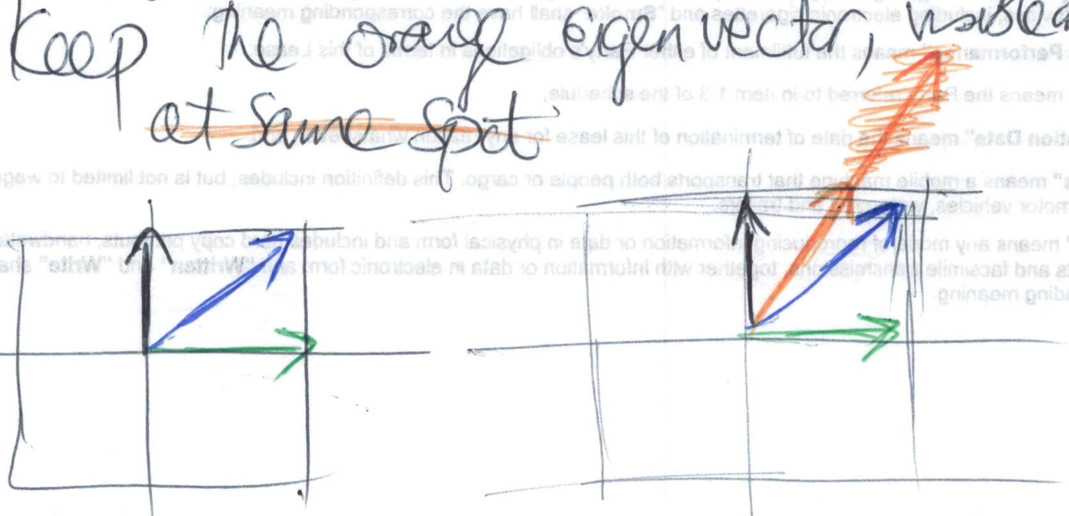
- the other 2 vectors are still not Eigenvector
- But look at 4th vector added 'orange'

which is Eigenvector -

what does that say? Eigenvectors are not always easy to spot

But can we prove that one?

- Let's go back to original square, and keep the orange eigenvector, instead ~~at same spot~~



→ we can here see orange vector is correctly, as proved, an eigen vector

– and as we get to more dimensions it became even more tougher.

– So we'll need a more robust mathematical description before we can proceed.