1 | Axler6.31 Gram-Schmidt Procedure

The Gram-Schmidt Procedure is used to turn a list into an orthonormal list with the same span. It's useful for finding orthonormal bases.

> Suppose $v_1, \ldots, v_m$ is a linearly independent list of vectors in V. Let $e_1 = v_1/\|v_1\|$. For $j = 2, \ldots, m$, define e_j inductively by
>
> $$e_j = \frac{v_j - \langle v_j, e_1 \rangle e_1 - \cdots - \langle v_j, e_{j-1} \rangle e_{j-1}}{\|\text{<numerator>}\|}$$
>
> Then $e_1, \ldots, e_m$ is an orthonormal list of vectors in V s.t. each prefix span is the same as in $v_1, \ldots, v_m$.

1.1 | intuition

Basically, for each vector, we divide out the components from the previous vectors and then normalize the size to ensure the norm is one.