



LINEAR ALGEBRA AND ITS APPLICATIONS

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CLASS-3

THE GRAM-SCHMIDT ORTHOGONALIZATION

The Gram-Schmidt process:

- It is a process of converting linearly independent vectors into orthonormal vectors.
- Consider any 3 independent vectors a, b, c . Then the first orthonormal $q_1 = a / \text{norm}(a)$.
- If ' b ' is perpendicular to the vector ' a ' then $q_2 = b / \text{norm}(b)$ otherwise $B = b - (q_1^T b)q_1$ and $q_2 = B / \text{norm}(B)$.

- If 'c' is perpendicular to the plane spanned by the vectors a and b then $q_3 = c / \text{norm}(c)$
otherwise $C = c - (q_1^T c)q_1 - (q_2^T c)q_2$ and $q_3 = C / \text{norm}(C)$.

This is the one idea of the whole Gram-Schmidt process, to subtract from every new vector its components in the directions that are already settled. That idea is used over and over again. When there is a fourth vector, we subtract away its components in the directions of q_1, q_2, q_3 .

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THANK YOU

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