

> #Nikita John, Attendance quiz lecture 10

> with(LinearAlgebra);

[&x, Add, Adjoint, BackwardSubstitute, BandMatrix, Basis, BezoutMatrix, BidiagonalForm, BilinearForm, CARE, CharacteristicMatrix, CharacteristicPolynomial, Column, ColumnDimension, ColumnOperation, ColumnSpace, CompanionMatrix, CompressedSparseForm, ConditionNumber, ConstantMatrix, ConstantVector, Copy, CreatePermutation, CrossProduct, DARE, DeleteColumn, DeleteRow, Determinant, Diagonal, DiagonalMatrix, Dimension, Dimensions, DotProduct, EigenConditionNumbers, Eigenvalues, Eigenvectors, Equal, ForwardSubstitute, FrobeniusForm, FromCompressedSparseForm, FromSplitForm, GaussianElimination, GenerateEquations, GenerateMatrix, Generic, GetResultDataType, GetResultShape, GivensRotationMatrix, GramSchmidt, HankelMatrix, HermiteForm, HermitianTranspose, HessenbergForm, HilbertMatrix, HouseholderMatrix, IdentityMatrix, IntersectionBasis, IsDefinite, IsOrthogonal, IsSimilar, IsUnitary, JordanBlockMatrix, JordanForm, KroneckerProduct, LA_Main, LUdecomposition, LeastSquares, LinearSolve, LyapunovSolve, Map, Map2, MatrixAdd, MatrixExponential, MatrixFunction, MatrixInverse, MatrixMatrixMultiply, MatrixNorm, MatrixPower, MatrixScalarMultiply, MatrixVectorMultiply, MinimalPolynomial, Minor, Modular, Multiply, NoUserValue, Norm, Normalize, NullSpace, OuterProductMatrix, Permanent, Pivot, PopovForm, ProjectionMatrix, QRdecomposition, RandomMatrix, RandomVector, Rank, RationalCanonicalForm, ReducedRowEchelonForm, Row, RowDimension, RowOperation, RowSpace, ScalarMatrix, ScalarMultiply, ScalarVector, SchurForm, SingularValues, SmithForm, SplitForm, StronglyConnectedBlocks, SubMatrix, SubVector, SumBasis, SylvesterMatrix, SylvesterSolve, ToeplitzMatrix, Trace, Transpose, TridiagonalForm, UnitVector, VandermondeMatrix, VectorAdd, VectorAngle, VectorMatrixMultiply, VectorNorm, VectorScalarMultiply, ZeroMatrix, ZeroVector, Zip]

(1)

> A := Matrix([[[-3/2, 3/2], [-3, 11/4]]]);

$$A := \begin{bmatrix} -\frac{3}{2} & \frac{3}{2} \\ -3 & \frac{11}{4} \end{bmatrix}$$

(2)

> Eigenvectors(A);

$$\begin{bmatrix} \frac{3}{4} \\ \frac{1}{2} \end{bmatrix}, \begin{bmatrix} \frac{2}{3} & \frac{3}{4} \\ 1 & 1 \end{bmatrix}$$

(3)

$$> \text{\#Finding } a \text{ \& } b \text{ such that } [1 \ 1] = a \cdot \left[\frac{2}{3}, 1 \right] + b \cdot \left[\frac{3}{4}, 1 \right]$$

$$S := \left\{ \frac{2}{3} \cdot a + \frac{3}{4} \cdot b = 1, a + b = 1 \right\}:$$

$\text{solve}(S, \{a, b\});$

$$\{a = -3, b = 4\}$$

(4)

> *\#first iteration*

$$\left(\frac{3}{4} \right) \cdot (-3) \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4) \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{1}{2}, \frac{5}{12} \right]$$

(5)

> *\#second iteration*

$$\left(\frac{3}{4} \right) \cdot (-3)^2 \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^2 \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{25}{2}, \frac{209}{12} \right]$$

(6)

> *\#third iteration*

$$\left(\frac{3}{4} \right) \cdot (-3)^3 \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^3 \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{37}{2}, \frac{269}{12} \right]$$

(7)

> *\#fourth iteration*

$$\left(\frac{3}{4} \right) \cdot (-3)^4 \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^4 \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{337}{2}, \frac{2777}{12} \right]$$

(8)

> *\#fifth iteration*

$$\left(\frac{3}{4} \right) \cdot (-3)^5 \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^5 \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{781}{2}, \frac{6005}{12} \right]$$

(9)

> *\#sixth iteration*

$$\left(\frac{3}{4} \right) \cdot (-3)^6 \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^6 \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{4825}{2}, \frac{39329}{12} \right]$$

(10)

> *\#seventh iteration*

$$\left(\frac{3}{4} \right) \cdot (-3)^7 \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^7 \cdot \left[\frac{3}{4}, 1 \right];$$

(11)

$$\left[\frac{14197}{2}, \frac{111389}{12} \right] \quad (11)$$

> #eighth iteration

$$\left(\frac{3}{4} \right) \cdot (-3)^8 \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^8 \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{72097}{2}, \frac{583337}{12} \right] \quad (12)$$

> #ninth iteration

$$\left(\frac{3}{4} \right) \cdot (-3)^9 \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^9 \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{242461}{2}, \frac{1920005}{12} \right] \quad (13)$$

> #tenth iteration

$$\left(\frac{3}{4} \right) \cdot (-3)^{10} \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^{10} \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{1107625}{2}, \frac{8920049}{12} \right] \quad (14)$$

> #11th iteration

$$\left(\frac{3}{4} \right) \cdot (-3)^{11} \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^{11} \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{4017157}{2}, \frac{31960109}{12} \right] \quad (15)$$

> #12th iteration

$$\left(\frac{3}{4} \right) \cdot (-3)^{12} \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^{12} \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{17308657}{2}, \frac{139000697}{12} \right] \quad (16)$$

> #13th iteration

$$\left(\frac{3}{4} \right) \cdot (-3)^{13} \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^{13} \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{65514541}{2}, \frac{522522005}{12} \right] \quad (17)$$

> #14th iteration

$$\left(\frac{3}{4} \right) \cdot (-3)^{14} \cdot \left[\frac{2}{3}, 1 \right] + \left(\frac{2}{3} \right) \cdot (4)^{14} \cdot \left[\frac{3}{4}, 1 \right];$$

$$\left[\frac{273218425}{2}, \frac{2190530369}{12} \right] \quad (18)$$

> #15th iteration

$$\left(\frac{3}{4}\right) \cdot (-3)^{15} \cdot \left[\frac{2}{3}, 1\right] + \left(\frac{2}{3}\right) \cdot (4)^{15} \cdot \left[\frac{3}{4}, 1\right];$$

$$\left[\frac{1059392917}{2}, \frac{8460794429}{12} \right]$$

(19)

> #16th iteration

$$\left(\frac{3}{4}\right) \cdot (-3)^{16} \cdot \left[\frac{2}{3}, 1\right] + \left(\frac{2}{3}\right) \cdot (4)^{16} \cdot \left[\frac{3}{4}, 1\right];$$

$$\left[\frac{4338014017}{2}, \frac{34747158857}{12} \right]$$

(20)

> #17th iteration

$$\left(\frac{3}{4}\right) \cdot (-3)^{17} \cdot \left[\frac{2}{3}, 1\right] + \left(\frac{2}{3}\right) \cdot (4)^{17} \cdot \left[\frac{3}{4}, 1\right];$$

$$\left[\frac{17050729021}{2}, \frac{136276692005}{12} \right]$$

(21)

> #18th iteration

$$\left(\frac{3}{4}\right) \cdot (-3)^{18} \cdot \left[\frac{2}{3}, 1\right] + \left(\frac{2}{3}\right) \cdot (4)^{18} \cdot \left[\frac{3}{4}, 1\right];$$

$$\left[\frac{69106897225}{2}, \frac{553242598289}{12} \right]$$

(22)

> #19th iteration

$$\left(\frac{3}{4}\right) \cdot (-3)^{19} \cdot \left[\frac{2}{3}, 1\right] + \left(\frac{2}{3}\right) \cdot (4)^{19} \cdot \left[\frac{3}{4}, 1\right];$$

$$\left[\frac{273715645477}{2}, \frac{2188562902349}{12} \right]$$

(23)

> #20th iteration

$$\left(\frac{3}{4}\right) \cdot (-3)^{20} \cdot \left[\frac{2}{3}, 1\right] + \left(\frac{2}{3}\right) \cdot (4)^{20} \cdot \left[\frac{3}{4}, 1\right];$$

$$\left[\frac{1102998412177}{2}, \frac{8827474081817}{12} \right]$$

(24)

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