Class—FCLA EE

Advanced Linear Algebra

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An 8×8 matrix, carefully engineered,

$$A = \begin{bmatrix} -14 & -2 & 3 & -15 & 3 & -6 & 4 & 3 \\ -6 & -7 & -10 & 21 & 7 & 8 & 3 & -9 \\ -24 & -17 & -11 & 23 & 17 & 14 & 6 & -13 \\ 19 & -3 & -10 & 37 & 2 & 17 & -5 & -10 \\ -21 & -15 & -12 & 20 & 17 & 11 & 6 & -11 \\ -30 & -5 & 4 & -24 & 5 & -9 & 8 & 4 \\ -37 & -11 & -1 & -14 & 11 & -5 & 12 & -1 \\ 22 & -1 & -8 & 32 & 0 & 16 & -6 & -6 \end{bmatrix}.$$

```
A = matrix(QQ, [
[-14, -2, 3, -15, 3, -6, 4, 3],
[-6, -7, -10, 21, 7, 8, 3, -9],
[-24, -17, -11, 23, 17, 14, 6, -13],
[19, -3, -10, 37, 2, 17, -5, -10],
[-21, -15, -12, 20, 17, 11, 6, -11],
[-30, -5, 4, -24, 5, -9, 8, 4],
[-37, -11, -1, -14, 11, -5, 12, -1],
[22, -1, -8, 32, 0, 16, -6, -6]
])
A
```

A very simple nonzero vector.

```
v = vector(QQ, 8, [1, 0, 0, 0, 0, 0, 0, 0])
v
```

Demonstration 1 Construct the vectors $A^i\vec{v}$ with a list comprehension.

Demonstration 2 And package into a matrix.

Demonstration 3 Row-reduce to find a relation of linear dependence (using smallest powers).

Demonstration 4 Form a polynomial, and factor it.

Demonstration 5 Test for non-trivial eigenspaces.