$In[\bullet]:=$ $A = \begin{pmatrix} -6 & -7 & -1 & -3 & -3 \\ 4 & 5 & 1 & 3 & 3 \\ 4/3 & 2/3 & -10/3 & -4/3 & 0 \\ -4/3 & -5/3 & 1/3 & -8/3 & 0 \\ -10/3 & -17/3 & -2/3 & -5/3 & -5 \end{pmatrix}$

$Out[\bullet]=$

$\left\{ \{-6, -7, -1, -3, -3\}, \{4, 5, 1, 3, 3\},\right.$

$\left\{\frac{4}{3}, \frac{2}{3}, -\frac{10}{3}, -\frac{4}{3}, 0\right\}, \left\{-\frac{4}{3}, -\frac{5}{3}, \frac{1}{3}, -\frac{8}{3}, 0\right\}, \left\{-\frac{10}{3}, -\frac{17}{3}, -\frac{2}{3}, -\frac{5}{3}, -5\right\}\right\}$

$In[\bullet]:=$ **Eigenvalues[A]**

$Out[\bullet]=$

$\{-3, -3, -2, -2, -2\}$

$In[\bullet]:=$ **NullSpace[A + 3 IdentityMatrix[5]]**

$Out[\bullet]=$

$\{\{1, -1, -2, 1, 1\}\}$

NullSpace[A + 2 IdentityMatrix[5]]

$Out[\bullet]=$

$\left\{\{2, -2, 0, 1, 1\}, \left\{\frac{3}{2}, -1, 1, 0, 0\right\}\right\}$

$In[\bullet]:=$ **CharacteristicPolynomial[A, x]**

$Out[\bullet]=$

$-72 - 156 x - 134 x^2 - 57 x^3 - 12 x^4 - x^5$

$In[\bullet]:=$ **MatrixMinimalPolynomial[a_List?MatrixQ, x_] :=**
  Module[{i, n = 1, qu = {}, mnm = {Flatten[IdentityMatrix[Length[a]]]}},
   While[Length[qu] == 0, AppendTo[mnm, Flatten[MatrixPower[a, n]]];
    qu = NullSpace[Transpose[mnm]];
    n++];
   First[qu].Table[x^i, {i, 0, n - 1}]]

$In[\bullet]:=$ **MatrixMinimalPolynomial[A, x]**

$Out[\bullet]=$

$36 + 60 x + 37 x^2 + 10 x^3 + x^4$

$In[\bullet]:=$ **Simplify[A.A.A.A.A + 12 A.A.A.A + 57 A.A.A + 134 A.A + 156 A + 72 IdentityMatrix[5]]**

$Out[\bullet]=$

$\{\{0, 0, 0, 0, 0\}, \{0, 0, 0, 0, 0\}, \{0, 0, 0, 0, 0\}, \{0, 0, 0, 0, 0\}, \{0, 0, 0, 0, 0\}\}$

$In[\bullet]:=$ **Simplify[A.A.A.A + 10 A.A.A + 37 A.A + 60 A + 36 IdentityMatrix[5]]**

$Out[\bullet]=$

$\{\{0, 0, 0, 0, 0\}, \{0, 0, 0, 0, 0\}, \{0, 0, 0, 0, 0\}, \{0, 0, 0, 0, 0\}, \{0, 0, 0, 0, 0\}\}$

$In[\bullet]:=$ **Solve[MatrixMinimalPolynomial[A, x] == 0, x]**

$Out[\bullet]=$

$\{\{x \rightarrow -3\}, \{x \rightarrow -3\}, \{x \rightarrow -2\}, \{x \rightarrow -2\}\}$

$In[\bullet]:=$ **Eigenvalues[A]**

$Out[\bullet]=$

$\{-3, -3, -2, -2, -2\}$