

1 Noyau et image

2 A:= $\begin{bmatrix} -1/5 & -2/5 \\ 3/5 & 6/5 \end{bmatrix}$

$$\begin{pmatrix} -\frac{1}{5} & -\frac{2}{5} \\ \frac{3}{5} & \frac{6}{5} \end{pmatrix}$$

3 A^2

$$\begin{pmatrix} -\frac{1}{5} & -\frac{2}{5} \\ \frac{3}{5} & \frac{6}{5} \end{pmatrix}$$

4 ker(A)

$$\begin{bmatrix} 2 & -1 \end{bmatrix}$$

5 image(A)

$$\begin{bmatrix} -1 & 3 \end{bmatrix}$$

6 Puissances de matrices

7 A:=(1/3)\*[[0,-2,-2],[2,0,-1],[2,1,0]]

$$\begin{pmatrix} 0 & -\frac{2}{3} & -\frac{2}{3} \\ \frac{2}{3} & 0 & -\frac{1}{3} \\ \frac{2}{3} & \frac{1}{3} & 0 \end{pmatrix}$$

8 A^2;A^3;A^4;A^5

$$\left( \begin{pmatrix} -\frac{8}{9} & -\frac{2}{9} & \frac{2}{9} \\ -\frac{2}{9} & -\frac{5}{9} & -\frac{4}{9} \\ \frac{2}{9} & -\frac{4}{9} & -\frac{5}{9} \end{pmatrix}, \begin{pmatrix} 0 & \frac{2}{3} & \frac{2}{3} \\ -\frac{2}{3} & 0 & \frac{1}{3} \\ -\frac{2}{3} & -\frac{1}{3} & 0 \end{pmatrix}, \begin{pmatrix} \frac{8}{9} & \frac{2}{9} & -\frac{2}{9} \\ \frac{2}{9} & \frac{5}{9} & \frac{4}{9} \\ -\frac{2}{9} & \frac{4}{9} & \frac{5}{9} \end{pmatrix}, \begin{pmatrix} 0 & -\frac{2}{3} & -\frac{2}{3} \\ \frac{2}{3} & 0 & -\frac{1}{3} \\ \frac{2}{3} & \frac{1}{3} & 0 \end{pmatrix} \right)$$

9 B:=[[1,a],[0,1]]

$$\begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$$

10 simplify(B^2);simplify(B^3);simplify(B^4);

$$\left( \begin{bmatrix} 1 & 2 \cdot a \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 3 \cdot a \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 4 \cdot a \\ 0 & 1 \end{bmatrix} \right)$$

11 J:=[[1\$4]\$4]

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

12 J^2;J^3;J^4;

$$\left( \begin{bmatrix} 4 & 4 & 4 & 4 \\ 4 & 4 & 4 & 4 \\ 4 & 4 & 4 & 4 \\ 4 & 4 & 4 & 4 \end{bmatrix}, \begin{bmatrix} 16 & 16 & 16 & 16 \\ 16 & 16 & 16 & 16 \\ 16 & 16 & 16 & 16 \\ 16 & 16 & 16 & 16 \end{bmatrix}, \begin{bmatrix} 64 & 64 & 64 & 64 \\ 64 & 64 & 64 & 64 \\ 64 & 64 & 64 & 64 \\ 64 & 64 & 64 & 64 \end{bmatrix} \right)$$

13 A:=[[1,0,a],[1,a,-1],[a,0,1]]

$$\begin{bmatrix} 1 & 0 & a \\ 1 & a & -1 \\ a & 0 & 1 \end{bmatrix}$$

14 solve(det(A)=0,a);

$$[-1 \quad 0 \quad 1]$$

15 A^(-1)

$$\begin{bmatrix} \frac{a}{-a^3+a} & 0 & \frac{-a^2}{-a^3+a} \\ \frac{-a-1}{-a^3+a} & \frac{-a^2+1}{-a^3+a} & \frac{a+1}{-a^3+a} \\ \frac{-a^2}{-a^3+a} & 0 & \frac{a}{-a^3+a} \end{bmatrix}$$

16 MARKOV

17 P:=[[.8,.3,.2],[.1,.2,.6],[.1,.5,.2]]

$$\begin{bmatrix} 0.8 & 0.3 & 0.2 \\ 0.1 & 0.2 & 0.6 \\ 0.1 & 0.5 & 0.2 \end{bmatrix}$$

18 X:=[[1000],[0],[0]]

$$\begin{bmatrix} 1000 \\ 0 \\ 0 \end{bmatrix}$$

19 P^7\*X

$$\begin{bmatrix} 563.8874 \\ 226.0691 \\ 210.0435 \end{bmatrix}$$

```
20 O3:=[[0]$3]
      [ 0 ]
      [ 0 ]
      [ 0 ]
21 idn(3)
      [ 1 0 0 ]
      [ 0 1 0 ]
      [ 0 0 1 ]
22 v:=ker(P-idn(3))
      [ - 2.61538461538  - 1.07692307692  - 1 ]
23 normalize(v)
      [ - 1.0  - 0.411764705882  - 0.382352941176 ]
24
```