9 octobre 2003

SPÉ P.T. – T.D. MAPLE N°2

Corrigé

Calcul matriciel – Déterminant – Equations linéaires

Exercice 1

```
restart:
with(linalg):
A:=matrix([[a,b,c],[b,a,b],[c,b,a]]):
M:=matrix(3,3):
C:=evalm(A &* M-M &* A):

eq:={seq(seq(C[i,j],j=1..3),i=1..3)}:
inconnues:={seq( seq(   M[i,j],j=1..3   ),i=1..3) }:
X:=genmatrix(eq,inconnues):

for k to nops(kernel(X)) do
      M||k:=matrix(3,3,op(k,[op(kernel(X))]))
od:
base := seq(eval(M||k),k=1..nops(kernel(X)));
```

```
Warning, the protected names norm and trace have been redefined and unprotected
```

$$base := \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, \begin{bmatrix} 0 & 1 & \frac{c}{b} \\ 1 & 0 & 1 \\ \frac{c}{b} & 1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

Exercice 2

```
restart : with(linalg):A:=matrix(2,2,1);X:=matrix(2,2):

Y:=evalm(X^2+X-A);

Y:={seq(seq(Y[i,j],j=1..2),i=1..2)};

solutions:={solve(Y)}:
for k to nops(solutions) do
  X:=matrix(2,2): assign(solutions[k]): print(X);
end do:
```

$$A := \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$

$$Y := \begin{bmatrix} X_{1,1}^{\,2} + X_{1,2} X_{2,1} + X_{1,1} - 1 & X_{1,1} X_{1,2} + X_{1,2} X_{2,2} + X_{1,2} - 1 \\ X_{2,1} X_{1,1} + X_{2,2} X_{2,1} + X_{2,1} - 1 & X_{1,2} X_{2,1} + X_{2,2}^{\,2} + X_{2,2} - 1 \end{bmatrix}$$

$$Y := \{ X_{1,1}^{\,2} + X_{1,2} X_{2,1} + X_{1,1} - 1,\ X_{1,2} X_{2,1} + X_{2,2}^{\,2} + X_{2,2} - 1,\ X_{1,1} X_{1,2} + X_{1,2} X_{2,2} + X_{1,2} - 1,\ X_{2,1} X_{1,1} + X_{2,2} X_{2,1} + X_{2,1} - 1 \}$$

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

On vérifie que réciproquement les 4 matrices précédentes sont bien solutions de l'équation.