```
> restart :
> interface(warnlevel = 0) :          # Maple 12
> with(LinearAlgebra) :
```

Chapter 7 Problem 2b

The eigenvalues and eigenvectors of the Pauli Matrices

```
> X := RowOperation(IdentityMatrix(2), [2, 1]);
```

$$X := \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \tag{1}$$

Determining the eigenvalues and eigenvector of a matrix using Maple's Eigenvectors() function

```
> L := Eigenvectors(X) :      # a list of the eigenvalues with their corresponding eigenvectors
  print(eigenvalue = L[1][1], eigenvector = L[2][1..2, 1], magnitude = Norm(L[2][1..2, 1], Euclidean));
  print(eigenvalue = L[1][2], eigenvector = L[2][1..2, 2], magnitude = Norm(L[2][1..2, 2], Euclidean));
```

$$eigenvalue = 1,\ eigenvector = \begin{bmatrix} 1 \\ 1 \end{bmatrix},\ magnitude = \sqrt{2}$$

$$eigenvalue = -1,\ eigenvector = \begin{bmatrix} -1 \\ 1 \end{bmatrix},\ magnitude = \sqrt{2} \tag{2}$$

```
> Y := Matrix([[0, -I], [I, 0]]);
  L := Eigenvectors(Y) :      # a list of the eigenvalues with their corresponding eigenvectors
  print(eigenvalue = L[1][1], eigenvector = L[2][1..2, 1], magnitude = Norm(L[2][1..2, 1], Euclidean));
  print(eigenvalue = L[1][2], eigenvector = L[2][1..2, 2], magnitude = Norm(L[2][1..2, 2], Euclidean));
```

$$Y := \begin{bmatrix} 0 & -I \\ I & 0 \end{bmatrix}$$

$$eigenvalue = 1,\ eigenvector = \begin{bmatrix} -I \\ 1 \end{bmatrix},\ magnitude = \sqrt{2}$$

$$eigenvalue = -1,\ eigenvector = \begin{bmatrix} I \\ 1 \end{bmatrix},\ magnitude = \sqrt{2} \tag{3}$$

```
> Z := Matrix([[1, 0], [0, -1]]);

  L := Eigenvectors(Z) :      # a list of the eigenvalues with their corresponding eigenvectors
  print(eigenvalue = L[1][1], eigenvector = L[2][1..2, 1], magnitude = Norm(L[2][1..2, 1], Euclidean));
  print(eigenvalue = L[1][2], eigenvector = L[2][1..2, 2], magnitude = Norm(L[2][1..2, 2], Euclidean));
```

$$Z := \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$

$$eigenvalue = 1,\ eigenvector = \begin{bmatrix} 1 \\ 0 \end{bmatrix},\ magnitude = 1$$

$$eigenvalue = -1,\ eigenvector = \begin{bmatrix} 0 \\ 1 \end{bmatrix},\ magnitude = 1 \qquad \textbf{(4)}$$