```
> with(LinearAlgebra);
```

[*&x*, *Add*, *Adjoint*, *BackwardSubstitute*, *BandMatrix*, *Basis*, *BezoutMatrix*, *BidiagonalForm*, *BilinearForm*, *CARE*, *CharacteristicMatrix*, *CharacteristicPolynomial*, *Column*, *ColumnDimension*, *ColumnOperation*, *ColumnSpace*, *CompanionMatrix*, *ConditionNumber*, *ConstantMatrix*, *ConstantVector*, *Copy*, *CreatePermutation*, *CrossProduct*, *DARE*, *DeleteColumn*, *DeleteRow*, *Determinant*, *Diagonal*, *DiagonalMatrix*, *Dimension*, *Dimensions*, *DotProduct*, *EigenConditionNumbers*, *Eigenvalues*, *Eigenvectors*, *Equal*, *ForwardSubstitute*, *FrobeniusForm*, *GaussianElimination*, *GenerateEquations*, *GenerateMatrix*, *Generic*, *GetResultDataType*, *GetResultShape*, *GivensRotationMatrix*, *GramSchmidt*, *HankelMatrix*, *HermiteForm*, *HermitianTranspose*, *HessenbergForm*, *HilbertMatrix*, *HouseholderMatrix*, *IdentityMatrix*, *IntersectionBasis*, *IsDefinite*, *IsOrthogonal*, *IsSimilar*, *IsUnitary*, *JordanBlockMatrix*, *JordanForm*, *KroneckerProduct*, *LA_Main*, *LUDecomposition*, *LeastSquares*, *LinearSolve*, *LyapunovSolve*, *Map*, *Map2*, *MatrixAdd*, *MatrixExponential*, *MatrixFunction*, *MatrixInverse*, *MatrixMatrixMultiply*, *MatrixNorm*, *MatrixPower*, *MatrixScalarMultiply*, *MatrixVectorMultiply*, *MinimalPolynomial*, *Minor*, *Modular*, *Multiply*, *NoUserValue*, *Norm*, *Normalize*, *NullSpace*, *OuterProductMatrix*, *Permanent*, *Pivot*, *PopovForm*, *QRDecomposition*, *RandomMatrix*, *RandomVector*, *Rank*, *RationalCanonicalForm*, *ReducedRowEchelonForm*, *Row*, *RowDimension*, *RowOperation*, *RowSpace*, *ScalarMatrix*, *ScalarMultiply*, *ScalarVector*, *SchurForm*, *SingularValues*, *SmithForm*, *StronglyConnectedBlocks*, *SubMatrix*, *SubVector*, *SumBasis*, *SylvesterMatrix*, *SylvesterSolve*, *ToeplitzMatrix*, *Trace*, *Transpose*, *TridiagonalForm*, *UnitVector*, *VandermondeMatrix*, *VectorAdd*, *VectorAngle*, *VectorMatrixMultiply*, *VectorNorm*, *VectorScalarMultiply*, *ZeroMatrix*, *ZeroVector*, *Zip*] **(1)**

```
> v:= Vector(3);
```

$$v := \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \quad \textbf{(2)}$$

```
> v(1):= Pi:
  v(2):=exp(1):
  v(3):=2:
> v;
```

$$\begin{bmatrix} \pi \\ e \\ 2 \end{bmatrix} \quad \textbf{(3)}$$

```
> f:= x-> x^2+1;
```

$$f := x \to x^2 + 1 \quad \textbf{(4)}$$

```
> w:= Vector(f,5);
```

(5)

$$w := \begin{bmatrix} 2 \\ 5 \\ 10 \\ 17 \\ 26 \end{bmatrix} \tag{5}$$

```
> Norm(v);
```

$$\pi \tag{6}$$

```
> Norm(v,2);
```

$$\sqrt{4+\pi^2+(e)^2} \tag{7}$$

```
> M := Matrix([[7,0,1,-3,5],
  [2,-1,0,1,4],
  [7,-3,2,-1,4],
  [8,6,-2,-7,4],
  [1,3,-5,7,5]]);
```

$$M := \begin{bmatrix} 7 & 0 & 1 & -3 & 5 \\ 2 & -1 & 0 & 1 & 4 \\ 7 & -3 & 2 & -1 & 4 \\ 8 & 6 & -2 & -7 & 4 \\ 1 & 3 & -5 & 7 & 5 \end{bmatrix} \tag{8}$$

```
> Transpose(M);
```

$$\begin{bmatrix} 7 & 2 & 7 & 8 & 1 \\ 0 & -1 & -3 & 6 & 3 \\ 1 & 0 & 2 & -2 & -5 \\ -3 & 1 & -1 & -7 & 7 \\ 5 & 4 & 4 & 4 & 5 \end{bmatrix} \tag{9}$$

```
> RowOperation(M,[2,1],-2/7);
```

$$\begin{bmatrix} 7 & 0 & 1 & -3 & 5 \\ 0 & -1 & -\frac{2}{7} & \frac{13}{7} & \frac{18}{7} \\ 7 & -3 & 2 & -1 & 4 \\ 8 & 6 & -2 & -7 & 4 \\ 1 & 3 & -5 & 7 & 5 \end{bmatrix} \tag{10}$$

```
> N:=Matrix(5);
  N:=M;
  for i from 2 to 5 do
  N:=RowOperation(N,[i,1],-M(i,1)/7):
  od:
```

$$N := \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$N := \begin{bmatrix} 7 & 0 & 1 & -3 & 5 \\ 2 & -1 & 0 & 1 & 4 \\ 7 & -3 & 2 & -1 & 4 \\ 8 & 6 & -2 & -7 & 4 \\ 1 & 3 & -5 & 7 & 5 \end{bmatrix} \quad (11)$$

```
> M;
```

$$\begin{bmatrix} 7 & 0 & 1 & -3 & 5 \\ 2 & -1 & 0 & 1 & 4 \\ 7 & -3 & 2 & -1 & 4 \\ 8 & 6 & -2 & -7 & 4 \\ 1 & 3 & -5 & 7 & 5 \end{bmatrix} \quad (12)$$

```
> N;
```

$$\begin{bmatrix} 7 & 0 & 1 & -3 & 5 \\ 0 & -1 & -\frac{2}{7} & \frac{13}{7} & \frac{18}{7} \\ 0 & -3 & 1 & 2 & -1 \\ 0 & 6 & -\frac{22}{7} & -\frac{25}{7} & -\frac{12}{7} \\ 0 & 3 & -\frac{36}{7} & \frac{52}{7} & \frac{30}{7} \end{bmatrix} \quad (13)$$

```
> MatrixMatrixMultiply(M,N);
```

$$\begin{bmatrix} 49 & -6 & -\frac{58}{7} & \frac{202}{7} & \frac{424}{7} \\ 14 & 19 & -\frac{150}{7} & \frac{128}{7} & \frac{160}{7} \\ 49 & 3 & -\frac{53}{7} & \frac{75}{7} & \frac{309}{7} \\ 56 & -30 & \frac{40}{7} & \frac{265}{7} & \frac{606}{7} \\ 7 & 69 & -\frac{368}{7} & \frac{33}{7} & \frac{190}{7} \end{bmatrix} \quad (14)$$

```
> M . N;
```

$$\begin{bmatrix} 49 & -6 & -\frac{58}{7} & \frac{202}{7} & \frac{424}{7} \\ 14 & 19 & -\frac{150}{7} & \frac{128}{7} & \frac{160}{7} \\ 49 & 3 & -\frac{53}{7} & \frac{75}{7} & \frac{309}{7} \\ 56 & -30 & \frac{40}{7} & \frac{265}{7} & \frac{606}{7} \\ 7 & 69 & -\frac{368}{7} & \frac{33}{7} & \frac{190}{7} \end{bmatrix} \quad \textbf{(15)}$$

```
> LinearSolve(M,w);
```

$$\begin{bmatrix} \frac{327}{136} \\ -\frac{1847}{136} \\ -\frac{367}{16} \\ -\frac{795}{136} \\ -\frac{513}{272} \end{bmatrix} \quad \textbf{(16)}$$

```
> M^5;
```

$$\begin{bmatrix} 31759 & 38688 & -35607 & 16285 & 50077 \\ 15290 & 22103 & -20636 & 10257 & 28040 \\ 30823 & 33093 & -32426 & 18711 & 51192 \\ 25448 & 35430 & -30450 & 9633 & 36324 \\ 10801 & 23691 & -26417 & 22351 & 38777 \end{bmatrix} \quad \textbf{(17)}$$