TP3-AN2010

```
# Cholesky
N =3
a = [3.0 for i in range(N)]
c = [-1.0 for i in range(N-1)]
A = matrix(RR,N,N)
for i in range(N):
    A[i,i]=a[i]
for i in range(N-1):
    A[i,i+1]=c[i]
for i in range(1,N):
    A[i,i-1]=c[i-1]
show(A)
```

$$\begin{pmatrix} 3.00000000000000 & -1.00000000000000 & 0.000000000000000 \\ -1.00000000000000 & 3.00000000000000 & -1.00000000000000 \\ 0.000000000000000 & -1.00000000000000 & 3.00000000000000 \end{pmatrix}$$

```
show(A.cholesky_decomposition())
```

$$\begin{pmatrix} 1.73205080756888 & 0.000000000000000 & 0.000000000000000 \\ -0.577350269189626 & 1.63299316185545 & 0.000000000000000 \\ 0.000000000000000 & -0.612372435695794 & 1.62018517460197 \end{pmatrix}$$

```
def cholesky(a,c):
    l = a
    m = c
    l[0]=sqrt(a[0]).n()
    for i in range(N-1):
        m[i]=c[i]/l[i].n()
        l[i+1]=(sqrt(a[i+1]-m[i]^2)).n()
    A = matrix(CC,N,N)
    for i in range(N):
        A[i,i]=l[i]
    for i in range(1,N):
        A[i,i-1]=m[i-1]
    #print(A)
    return(A)
```

```
a = [3.0 for i in range(N)]
c = [-1.0 for i in range(N-1)]
show(cholesky(a,c))
```

$$\begin{pmatrix} 1.73205080756888 & 0 & 0 \\ -0.577350269189626 & 1.63299316185545 & 0 \\ 0 & -0.612372435695794 & 1.62018517460197 \end{pmatrix}$$

```
def cholesky(a,c):
    l = a
    m = c
    a[0]=sqrt(a[0]).n()
    for i in range(N-1):
        c[i]=c[i]/a[i].n()
        a[i+1]=(sqrt(a[i+1]-c[i]^2)).n()
    A = matrix(CC,N,N)
    for i in range(N):
        A[i,i]=a[i]
    for i in range(1,N):
        A[i,i-1]=c[i-1]
    #print(A)
    return(A)
```

```
a = [3.0 for i in range(N)]
c = [-1.0 for i in range(N-1)]
show(cholesky(a,c))
```

$$\begin{pmatrix} 1.73205080756888 & 0 & 0 \\ -0.577350269189626 & 1.63299316185545 & 0 \\ 0 & -0.612372435695794 & 1.62018517460197 \end{pmatrix}$$

```
var('a1,a2,a0,c1,c0,l1,l2,l0,m1,m0')
V.<a1,a2,a0,c1,c0,l1,l2,l0,m1,m0>=PolynomialRing(RR)
```

```
N =3
a = [a0,a1,a2]
c = [c0,c1]
A = matrix(V,N,N)
for i in range(N):
    A[i,i]=a[i]
for i in range(N-1):
```

```
    A[i,i+1]=c[i]
for i in range(1,N):
    A[i,i-1]=c[i-1]
show(A)
```

$$\begin{pmatrix} a_0 & c_0 & 0 \\ c_0 & a_1 & c_1 \\ 0 & c_1 & a_2 \end{pmatrix}$$

```
N =3
l = [l0,l1,l2]
m = [m0,m1]
R = matrix(V,N,N)
for i in range(N):
    R[i,i]=l[i]
for i in range(1,N):
    R[i,i-1]=m[i-1]
show(R)
```

$$\begin{pmatrix} l_0 & 0 & 0 \\ m_0 & l_1 & 0 \\ 0 & m_1 & l_2 \end{pmatrix}$$

```
show(R*R.transpose())
```

$$\begin{pmatrix} l_0^2 & l_0 m_0 & 0 \\ l_0 m_0 & l_1^2 + m_0^2 & l_1 m_1 \\ 0 & l_1 m_1 & l_2^2 + m_1^2 \end{pmatrix}$$