AlgeoSVD

October 13, 2020

```
In [66]: A=matrix(RDF,[[3,0],[1,1],[0,3]])
         show(A)
```

```
[3.0 0.0]
[1.0 1.0]
[0.0 3.0]
```

```
In [67]: U,Sigma,V=A.SVD()
```

```
In [68]: sigma_1=Sigma[0,0]
         sigma_2=Sigma[1,1]

         show('sigma_1 = ',sigma_1)
         show('sigma_2 = ',sigma_2)
```

```
'sigma_1 = ' 3.3166247903554003
```

```
'sigma_2 = ' 3.0
```

```
In [69]: D=diagonal_matrix([sigma_1,sigma_2 ])
         show(D)
```

```
[3.3166247903554003                0.0]
[                0.0                3.0]
```

```
In [70]: show(Sigma)
```

```
[3.3166247903554003                0.0]
[                0.0                3.0]
[                0.0                0.0]
```

```
In [71]: show(U)
```

```
[   -0.6396021490668312     0.7071067811865477    0.30151134457776363]
[   -0.4264014327112208 1.6653345369377348e-16    -0.9045340337332908]
[   -0.6396021490668313    -0.7071067811865472    0.30151134457776363]
```

In [72]:
```
show(V)
```

```
[-0.7071067811865475  0.7071067811865477]
[-0.7071067811865477 -0.7071067811865475]
```

In [73]:
```
show(A-U*Sigma*(V.transpose()))
```

```
[                   0.0 -2.220446049250313e-16]
[-2.220446049250313e-16 1.1102230246251565e-16]
[                   0.0                    0.0]
```

In [74]:
```
(A - U*Sigma*V.transpose()).norm(p='frob')
```

Out[74]: 3.3306690738754696e-16

In [75]:
```
#Aproximaciones
A_1=sigma_1*matrix([[U[0,0]],[U[1,0]],[U[2,0]]])*(matrix([[V[0,0]],[V[1,0]]]).transpos
show(A_1)
A_2=sigma_1*matrix([[U[0,0]],[U[1,0]],[U[2,0]]])*(matrix([[V[0,0]],[V[1,0]]]).transpos
show(A_2)
```

```
[1.4999999999999998 1.5000000000000002]
[0.9999999999999998 1.0000000000000002]
[                1.5 1.5000000000000004]
```

```
[                  3.0 2.220446049250313e-16]
[   1.0000000000000002    0.9999999999999999]
[                  0.0                   3.0]
```

In [76]:
```
show(U*Sigma*V.transpose()-A_2)
show(U*Sigma*V.transpose()-A)
```

```
[0.0 0.0]
[0.0 0.0]
[0.0 0.0]
```

```
[                   0.0   2.220446049250313e-16]
[  2.220446049250313e-16 -1.1102230246251565e-16]
[                   0.0                    0.0]
```

In [ ]:

In [ ]: