

```
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%Lab-3
```

```
%1)
% Set the matrix A
A = [1 0 1 ; -1 1 0];

% Compute the singular values and vectors of A*A'
[V1,D1] = eig(A*A. ');
[~,ind] = sort(diag(D1),'descend');
V1 = V1(:,ind);
S = sqrt(D1(ind,ind));
U = A.'*V1*S^(-1);

% Display the results
disp('Original matrix A:');
```

Original matrix A:

```
disp(A);
```

```
     1     0     1
    -1     1     0
```

```
disp('Singular value matrix S:');
```

Singular value matrix S:

```
disp(S);
```

```
    1.7321     0
         0    1.0000
```

```
disp('Left singular vector matrix U:');
```

Left singular vector matrix U:

```
disp(U);
```

```
   -0.8165         0
    0.4082   -0.7071
   -0.4082   -0.7071
```

```
disp('Right singular vector matrix V:');
```

Right singular vector matrix V:

```
disp(V1);
```

```
   -0.7071   -0.7071
    0.7071   -0.7071
```

```
%2)
```

```
% Set the matrix A
A = [1 2;2 1;1 1 ];

% Compute the singular values and vectors of A*A'
[V1,D1] = eig(A*A. ');
[~,ind] = sort(diag(D1),'descend');
V1 = V1(:,ind);
S = sqrt(D1(ind,ind));
U = A. '*V1*S^(-1);

% Display the results
disp('Original matrix A:');
```

Original matrix A:

```
disp(A);
```

```
1    2
2    1
1    1
```

```
disp('Singular value matrix S:');
```

Singular value matrix S:

```
disp(S);
```

```
3.3166 + 0.0000i    0.0000 + 0.0000i    0.0000 + 0.0000i
0.0000 + 0.0000i    1.0000 + 0.0000i    0.0000 + 0.0000i
0.0000 + 0.0000i    0.0000 + 0.0000i    0.0000 + 0.0000i
```

```
disp('Left singular vector matrix U:');
```

Left singular vector matrix U:

```
disp(U);
```

```
0.7071 + 0.0000i   -0.7071 + 0.0000i    0.0000 + 0.0000i
0.7071 + 0.0000i    0.7071 + 0.0000i    0.0000 + 0.0000i
```

```
disp('Right singular vector matrix V:');
```

Right singular vector matrix V:

```
disp(V1);
```

```
0.6396    0.7071    0.3015
0.6396   -0.7071    0.3015
0.4264   -0.0000   -0.9045
```

```
%3)
% Set the matrix A
A = [1 0 1 0;0 1 0 1];

% Compute the singular values and vectors of A*A'
[V1,D1] = eig(A*A. ');
```

```
[~,ind] = sort(diag(D1),'descend');
V1 = V1(:,ind);
S = sqrt(D1(ind,ind));
U = A.'*V1*S^(-1);
```

```
% Display the results
disp('Original matrix A:');
```

Original matrix A:

```
disp(A);
```

```
1    0    1    0
0    1    0    1
```

```
disp('Singular value matrix S:');
```

Singular value matrix S:

```
disp(S);
```

```
1.4142    0
0    1.4142
```

```
disp('Left singular vector matrix U:');
```

Left singular vector matrix U:

```
disp(U);
```

```
0.7071    0
0    0.7071
0.7071    0
0    0.7071
```

```
disp('Right singular vector matrix V:');
```

Right singular vector matrix V:

```
disp(V1);
```

```
1    0
0    1
```

```
%4)
% Set the matrix A
A = [3 2 2;2 3 -2];

% Compute the singular values and vectors of A*A'
[V1,D1] = eig(A*A. ');
 [~,ind] = sort(diag(D1),'descend');
V1 = V1(:,ind);
S = sqrt(D1(ind,ind));
U = A.'*V1*S^(-1);

% Display the results
```

```
disp('Original matrix A:');
```

Original matrix A:

```
disp(A);
```

```
3    2    2
2    3   -2
```

```
disp('Singular value matrix S:');
```

Singular value matrix S:

```
disp(S);
```

```
5    0
0    3
```

```
disp('Left singular vector matrix U:');
```

Left singular vector matrix U:

```
disp(U);
```

```
0.7071   -0.2357
0.7071    0.2357
0        -0.9428
```

```
disp('Right singular vector matrix V:');
```

Right singular vector matrix V:

```
disp(V1);
```

```
0.7071   -0.7071
0.7071    0.7071
```