Computer Exercise 8.2.10

The following program will determine the singular value decomposition of two different matrices such that $\mathbf{A} = \mathbf{UDV}^T$; the built-in MATLAB function 'svd' will be used to accoplish this. The outputted matrices $\mathbf{U}, \mathbf{D},$ and $\mathbf{V}$ will be used to check that $\mathbf{UDV}^T$ returns $\mathbf{A}$.

a) $\mathbf{A} = \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$

```
A = [1, 1; 0, 1; 1, 0];
[U, D, V] = svd(A);
A
```

```
A = 3×2
     1     1
     0     1
     1     0
```

```
%round function is used
%because 'negative zeros' were
%being displayed; also the default
%(floating point) output is messy
round(U*D*V')
```

```
ans = 3×2
     1     1
     0     1
     1     0
```

b) $\mathbf{A} = \begin{bmatrix} 1 & 3 & -2 \\ 2 & 7 & 5 \\ -2 & -3 & 4 \\ 5 & -3 & -2 \end{bmatrix}$

```
A = [1, 3, -2; 2, 7, 5; -2, -3, 4; 5, -3, -2];
[U, D, V] = svd(A);
A
```

```
A = 4×3
     1     3    -2
     2     7     5
    -2    -3     4
     5    -3    -2
```

```
round(U*D*V')
```

```
ans = 4×3
     1     3    -2
     2     7     5
    -2    -3     4
     5    -3    -2
```

In both parts **a** and **b,** we see that $\mathbf{UDV}^T$ returns $\mathbf{A}$.