W state as a product structure

**This note investigates the SVD of the W -
sate as used in lecture II. Sheet 0 of the HWK does something similar.
http : // www.comlab.ox.ac.uk / activities / quantum / course /**

In[6]:=
```
w = {{0, 1, 1, 0}, {1, 0, 0, 0}}
```

Out[6]=
```
{{0, 1, 1, 0}, {1, 0, 0, 0}}
```

In[7]:=
```
{s, v, d} = SingularValueDecomposition[w]
```

Out[7]=
$$\left\{\{\{1, 0\}, \{0, 1\}\}, \left\{\left\{\sqrt{2}, 0, 0, 0\right\}, \{0, 1, 0, 0\}\right\}, \left\{\{0, 1, 0, 0\}, \left\{\frac{1}{\sqrt{2}}, 0, 0, -\frac{1}{\sqrt{2}}\right\}, \left\{\frac{1}{\sqrt{2}}, 0, 0, \frac{1}{\sqrt{2}}\right\}, \{0, 0, 1, 0\}\right\}\right\}$$

In[8]:=
```
MatrixForm[d]
```

Out[8]//MatrixForm=
$$\begin{pmatrix} 0 & 1 & 0 & 0 \\ \frac{1}{\sqrt{2}} & 0 & 0 & -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & 0 & 0 & \frac{1}{\sqrt{2}} \\ 0 & 0 & 1 & 0 \end{pmatrix}$$

In[9]:=
```
MatrixForm[s]
```

Out[9]//MatrixForm=
$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

In[10]:=
```
MatrixForm[v]
```

Out[10]//MatrixForm=
$$\begin{pmatrix} \sqrt{2} & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}$$