

```
In[141]:= (* Following and modifying Section 3.12
in "The fuzzy space construction kit" by Andreas Sykora
Change step to 1/100 and uncomment final commands to make the video.
Compress in linux with
ffmpeg -i lowering_genus.avi -
vcodec msmpeg4v2 -q:v 5 lowering_genus_cmprsd.avi.avi
*)
```

```
In[142]:= Clear[r]
```

```
In[143]:= n = 6;
```

```
In[144]:= V = {{8/10, 1, 1, 0, 0, 0}, {0, 0, 0, 1, 0, 0}, {0, 0, 16/10, r, 1, 0},
{0, 0, 0, 8/10, 0, 1}, {0, 0, 0, 0, 24/10, 1}, {0, 0, 0, 0, 0, 16/10}};
```

```
In[145]:= MatrixForm[V]
```

```
Out[145]/MatrixForm=
```

$$\begin{pmatrix} \frac{4}{5} & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & \frac{8}{5} & r & 1 & 0 \\ 0 & 0 & 0 & \frac{4}{5} & 0 & 1 \\ 0 & 0 & 0 & 0 & \frac{12}{5} & 1 \\ 0 & 0 & 0 & 0 & 0 & \frac{8}{5} \end{pmatrix}$$

```
In[146]:= Z = (1/10) * {{0, 0, 0, 0, 0, 0}, {0, 13, 0, 0, 0, 0}, {0, 0, 13, 0, 0, 0},
{0, 0, 0, 26, 0, 0}, {0, 0, 0, 0, 26, 0}, {0, 0, 0, 0, 0, 39}};
```

```
In[147]:= MatrixForm[Z]
```

```
Out[147]/MatrixForm=
```

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{13}{10} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{13}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{13}{5} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{13}{5} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{39}{10} \end{pmatrix}$$

```
In[148]:= X = (1/2) * ConjugateTranspose[V] + (1/2) * V;
```

In[149]:= **MatrixForm[X]**

Out[149]/MatrixForm=

$$\begin{pmatrix} \frac{4}{5} & \frac{1}{2} & \frac{1}{2} & 0 & 0 & 0 \\ \frac{1}{2} & 0 & 0 & \frac{1}{2} & 0 & 0 \\ \frac{1}{2} & 0 & \frac{8}{5} & \frac{r}{2} & \frac{1}{2} & 0 \\ 0 & \frac{1}{2} & \frac{\text{Conjugate}[r]}{2} & \frac{4}{5} & 0 & \frac{1}{2} \\ 0 & 0 & \frac{1}{2} & 0 & \frac{12}{5} & \frac{1}{2} \\ 0 & 0 & 0 & \frac{1}{2} & \frac{1}{2} & \frac{8}{5} \end{pmatrix}$$

In[150]:= **Y = (i/2) \* ConjugateTranspose[V] - (i/2) \* V;**

In[151]:= **0**

Out[151]= **0**

In[152]:= **MatrixForm[Y]**

Out[152]/MatrixForm=

$$\begin{pmatrix} 0 & -\frac{i}{2} & -\frac{i}{2} & 0 & 0 & 0 \\ \frac{i}{2} & 0 & 0 & -\frac{i}{2} & 0 & 0 \\ \frac{i}{2} & 0 & 0 & -\frac{i r}{2} & -\frac{i}{2} & 0 \\ 0 & \frac{i}{2} & \frac{1}{2} i \text{Conjugate}[r] & 0 & 0 & -\frac{i}{2} \\ 0 & 0 & \frac{i}{2} & 0 & 0 & -\frac{i}{2} \\ 0 & 0 & 0 & \frac{i}{2} & \frac{i}{2} & 0 \end{pmatrix}$$

In[153]:= **sigma1 = {{0, 1}, {1, 0}};**

In[154]:= **sigma2 = {{0, -I}, {I, 0}};**

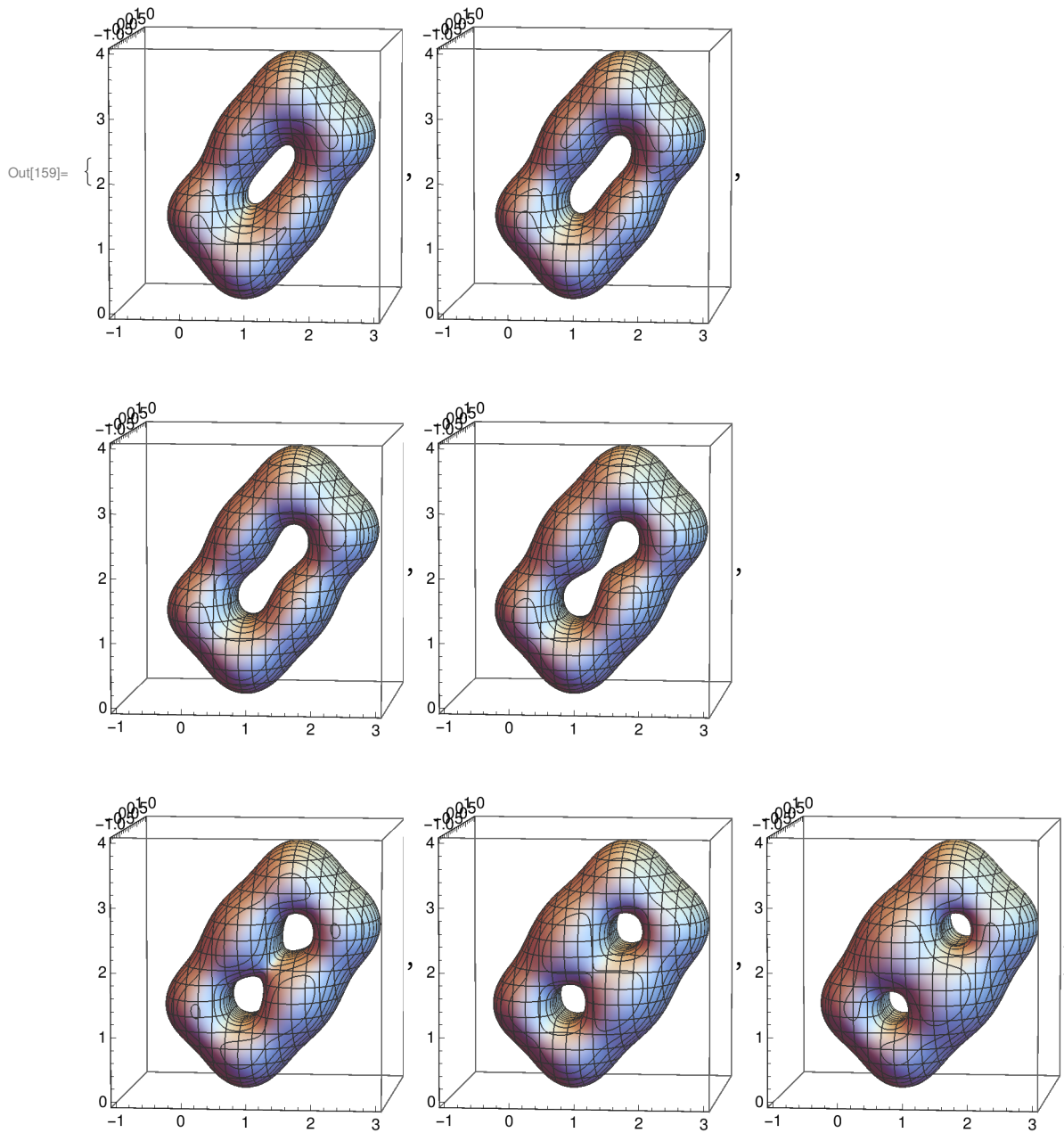
In[155]:= **sigma3 = {{1, 0}, {0, -1}};**

In[156]:= **loclr = KroneckerProduct[sigma1, X - x \* IdentityMatrix[n]] +  
KroneckerProduct[sigma2, Y - y \* IdentityMatrix[n]] +  
KroneckerProduct[sigma3, Z - z \* IdentityMatrix[n]];**

In[157]:= **charpoly = Det[loclr];**

In[158]:= **step = 1/6;**

```
In[159]:= plots = ParallelTable[ContourPlot3D[charpoly == 0,
  {x, -1, 3}, {y, -1, 1}, {z, 0, 4}, Contours -> {{1, LightBlue}},
  PlotPoints -> 100, ViewPoint -> {2, -18, 2}], {r, 0, 1, step}]
```



```
In[160]:=
```

```
In[161]:= Export["lowering_genus_1.eps", plots[[4]], ImageSize -> 3.2 * 72];
```

```
In[162]:= Export["lowering_genus_2.eps", plots[[5]], ImageSize -> 3.2 * 72];
```

```
In[163]:= Export["lowering_genus_3.eps", plots[[6]], ImageSize -> 3.2 * 72];
```

```
In[164]:= Export["lowering_genus_4.eps", plots[[7]], ImageSize -> 3.2 * 72];
```

In[165]:=

In[166]:=

In[167]:= **(\*plotsall = Join[plots,Reverse[plots]];\*)**

In[168]:= **(\*Export["lowering\_genus.avi",plotsall]\*)**