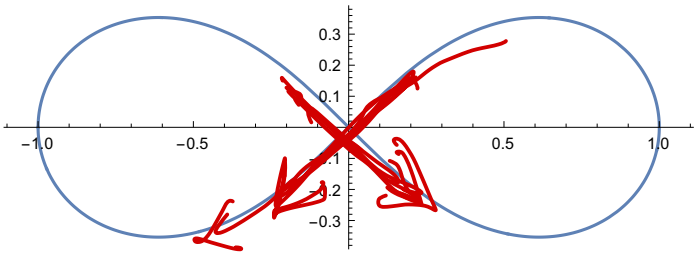
Lemniscate

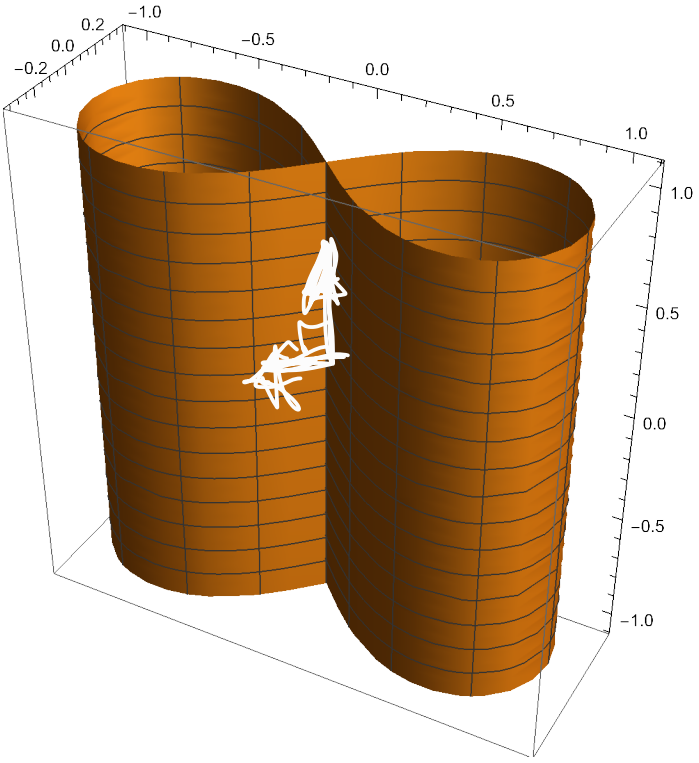
In[1]:=
```
lem[t_] := {Cos[t], Sin[t] Cos[t]} / (1 + Sin[t]^2);
ParametricPlot [lem[t], {t, -Pi, Pi}]
```

Out[2]=



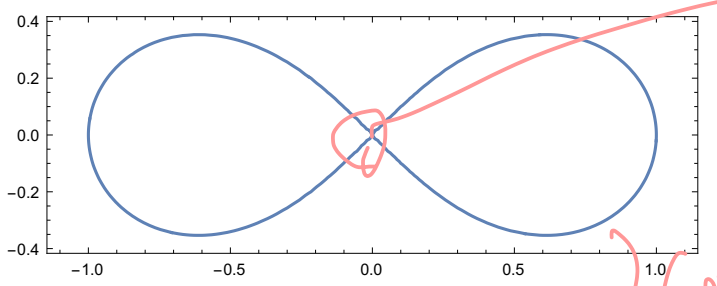
In[3]:=
```
lemP[u_, v_] := Join[lem[u], {v}] // Evaluate ;
ParametricPlot3D [lemP[u, v], {u, -Pi, Pi}, {v, -1, 1}]
```

Out[4]=



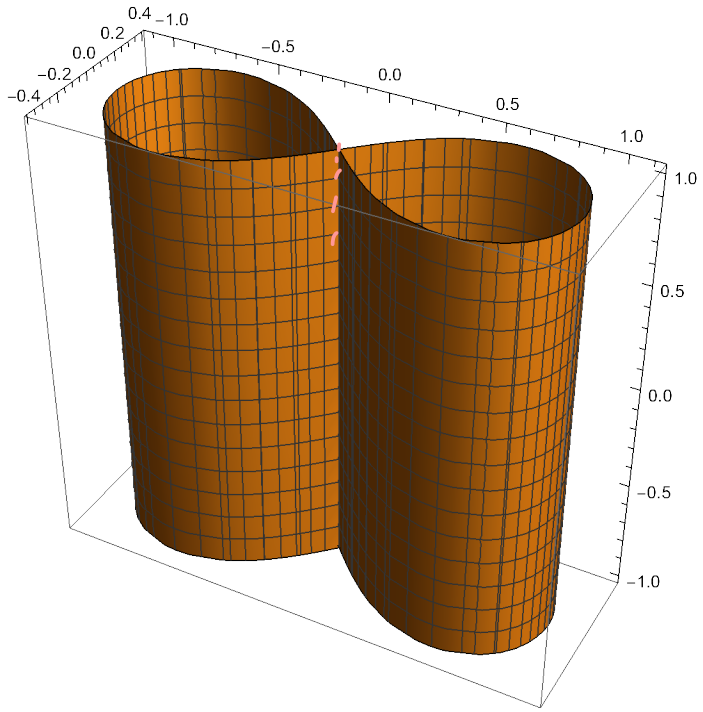
In[5]:=
```
lemI[x_, y_] := (x^2 + y^2)^2 - (x^2 - y^2);
ContourPlot[lemI[x, y] == 0, {x, -1.1, 1.1}, {y, -0.4, 0.4},
    AspectRatio → Automatic]
```

Out[6]=



In[7]:=
```
ContourPlot3D[lemI[x, y] == 0, {x, -1.1, 1.1},
 {y, -0.4, 0.4}, {z, -1, 1}, BoxRatios → Automatic]
```

Out[7]=

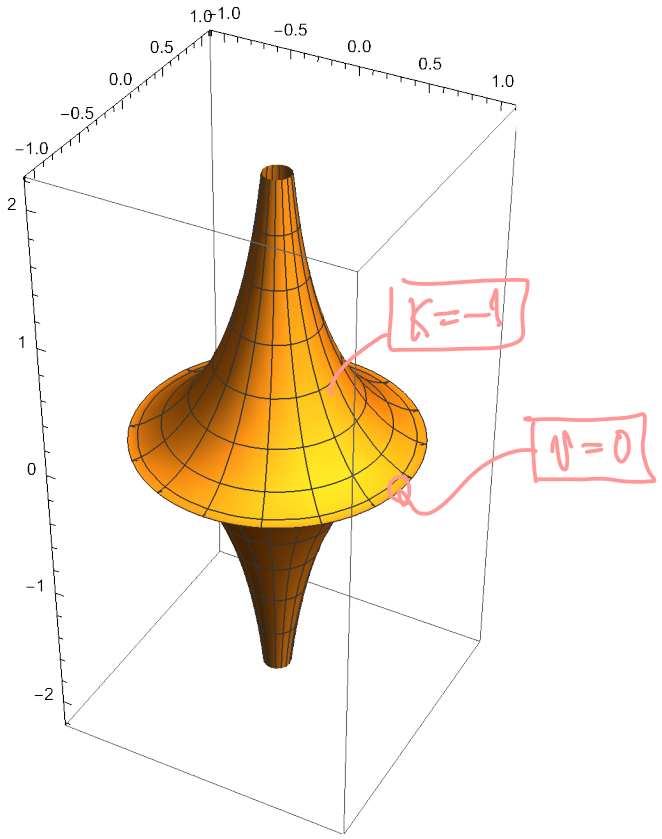


Problem 1-1 (Dini's pseudosphere)

In[8]:=
```
p[t_][u_, v_] := {
   Cos[t] Sech[v] Cos[u],
   Cos[t] Sech[v] Sin[u],
   Cos[t] (v - Tanh[v]) + Sin[t] u}
```

In[9]:=
```
ParametricPlot3D [p[0][u, v], {u, -Pi, Pi}, {v, -3, 3}]
```

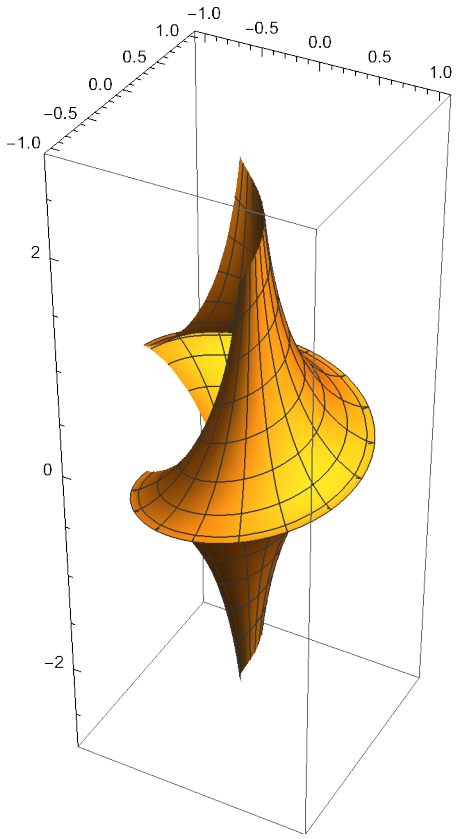
Out[9]=



a=1, b=0

In[10]:=
```
ParametricPlot3D [p[0.2][u, v], {u, -Pi, Pi}, {v, -3, 3}]
```

Out[10]=



a=cos 0.2

b=sin 0.2

In[ ]:=
```
ListAnimate [Table[
    ParametricPlot3D [p[t][u, v], {u, -Pi, Pi}, {v, -3, 3},
        PlotRange → {{-1, 1}, {-1, 1}, {-3, 3}}], {t, -Pi / 2, Pi / 2, Pi / 8}]]
```

Problem 1 - 2

In[11]:=
```
ContourPlot3D[x^4 + y^4 + z^4 - 1 == 0, {x, -1.1, 1.1}, {y, -1.1, 1.1}, {z, -1.1, 1.1}]
```

Out[11]=