Spiraler (4)

Inspireret af artikel:
"Spirals on surfaces of revolution" af Cristian Lazureanu:
http://elib.mi.sanu.ac.rs/files/journals/vm/57/vmn57p2-10.pdf

```
restart
with(plots):
with(VektorAnalyse4):
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Rotation om z-aksen:
https://en.wikipedia.org/wiki/Rotation_matrix#In_three_dimensions

$$R_z(\theta) := \begin{bmatrix} \cos(\theta) & -\sin(\theta) & 0 \\ \sin(\theta) & \cos(\theta) & 0 \\ 0 & 0 & 1 \end{bmatrix}:$$

Hyperbolsk helix

$$r_7(t) := R_z(t).\left\langle \frac{\alpha}{t}, 0, c\cdot t \right\rangle :$$

$$r_7(t) = \begin{bmatrix} \frac{\cos(t)\,\alpha}{t} \\ \frac{\sin(t)\,\alpha}{t} \\ c\,t \end{bmatrix}$$

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R7 := spacecurve([vop(subs(α=20, β=20, c=1, r7(t)))], t=2..20, color=blue, thickness=3, labels=[x, y, z], scaling=constrained)
```
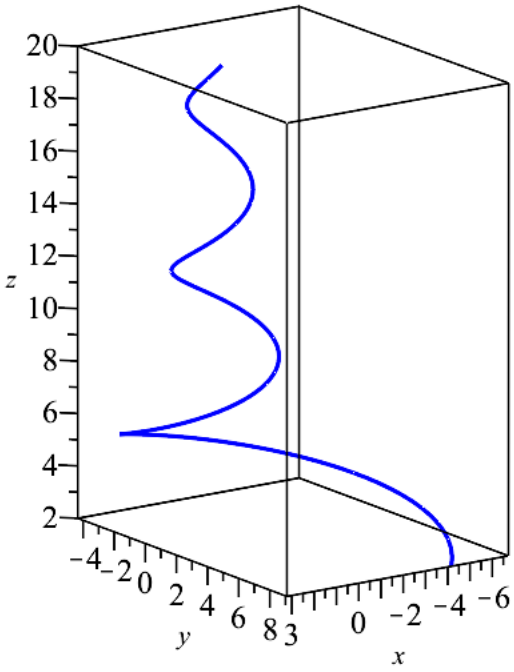
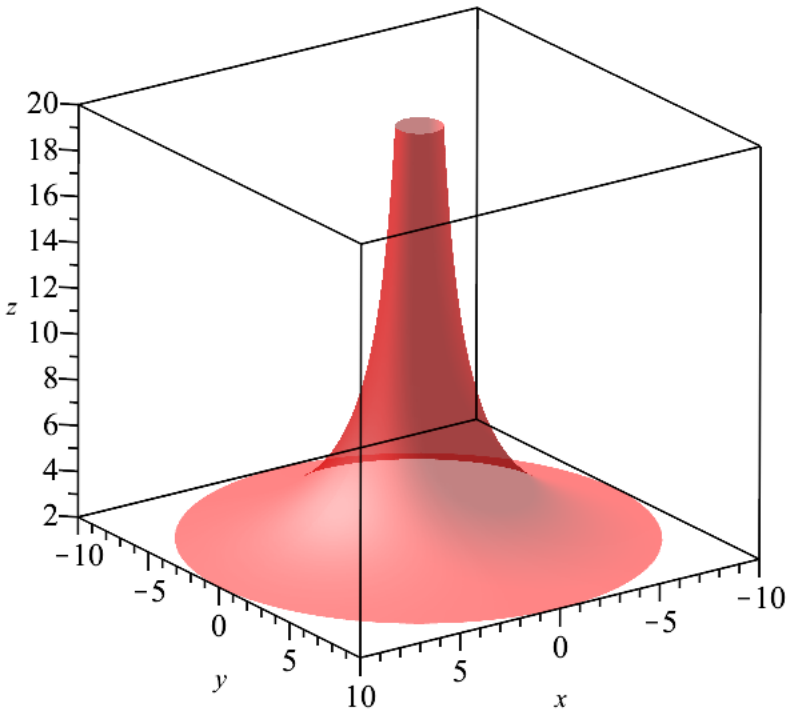



Hyperbol:

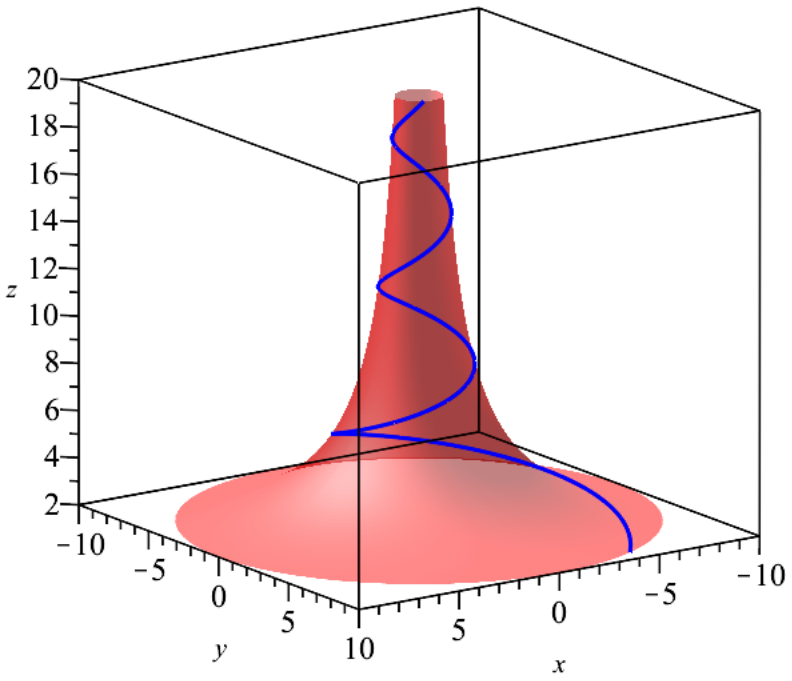
$$r_{hyperbol}(u, v) := R_z(v).\left\langle \frac{\alpha}{c \cdot u}, 0, c \cdot u \right\rangle :$$

$$r_{hyperbol}(u, v) = \begin{bmatrix} \frac{\cos(v)\ \alpha}{c\ u} \\ \frac{\sin(v)\ \alpha}{c\ u} \\ c\ u \end{bmatrix}$$

$$R_{hyperbol} := plot3d\left(subs\left(\alpha = 20, \beta = 20, c = 1, r_{hyperbol}(u, v)\right), u = 2..20, v = 0..2 \cdot \pi \cdot 3, color = red, transparency = 0.8, labels = [x, y, z], scaling = constrained, numpoints = 10000, style = patchnogrid\right)$$



$display\left(R_7, R_{hyperbol}\right)$

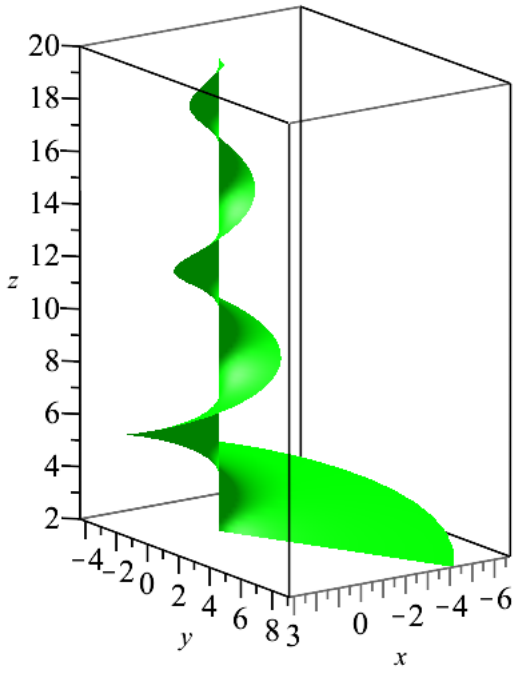


Hyperbolsk heliocoide

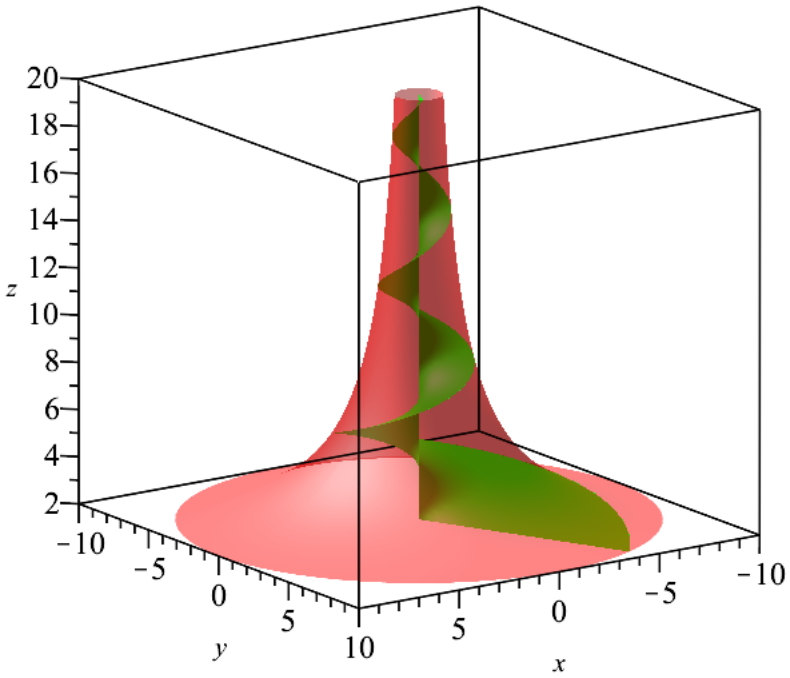
$$r_8(u,v) := \left\langle \alpha\cdot\frac{u}{v}\cdot\cos(v),\ \alpha\cdot\frac{u}{v}\cdot\sin(v),\ c\cdot v \right\rangle :$$

$$r_8(u,v) = \begin{bmatrix} \frac{\alpha\, u\, \cos(v)}{v} \\ \frac{\alpha\, u\, \sin(v)}{v} \\ c\, v \end{bmatrix}$$

$$R_8 := plot3d\left(subs\left(\alpha = 20, \beta = 20, c = 1, r_8(u,v)\right), u = 0..1, v = 2..20, color = green, labels = [x,y,z], scaling = constrained, numpoints = 10000, style = patchnogrid\right)$$



$$display\left(R_8, R_{hyperbol}\right)$$


20
18
16
14
12
10
8
6
4
2
z
−10
−5
0
5
10
y
−10
−5
0
5
x