Spiraler (7)

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*) :

Rotation om z-aksen:
https://en.wikipedia.org/wiki/Rotation_matrix#In_three_dimensions

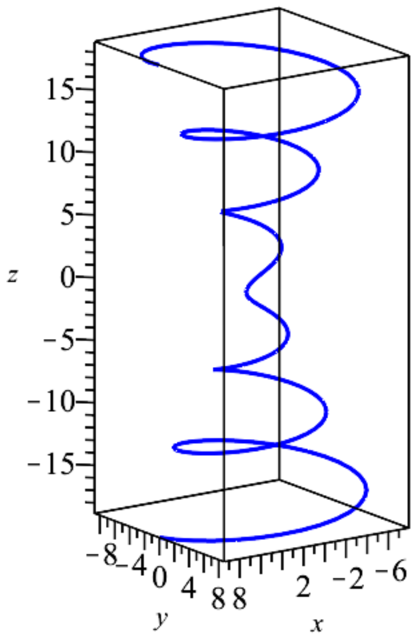
$$R_z(\theta) := \begin{bmatrix} \cos(\theta) & -\sin(\theta) & 0 \\ \sin(\theta) & \cos(\theta) & 0 \\ 0 & 0 & 1 \end{bmatrix} :$$

Hyperbolsk helix

$$r_{13}(t) := R_z\left(\frac{t}{c}\right) . \left\langle p \cdot \sqrt{\frac{t^2}{q^2} + 1}, 0, t \right\rangle :$$

$$r_{13}(t) = \begin{bmatrix} \cos\left(\frac{t}{c}\right) p \sqrt{\frac{t^2}{q^2} + 1} \\ \sin\left(\frac{t}{c}\right) p \sqrt{\frac{t^2}{q^2} + 1} \\ t \end{bmatrix}$$

$R_{13} := spacecurve\left(\left[vop\left(subs\left(p = 1, q = 2, c = 1, r_{13}(t)\right)\right)\right], t = -2 \cdot \pi \cdot 3 \,..\, 2 \cdot \pi \cdot 3, color = blue, thickness = 3, labels = [x, y, z], scaling = constrained\right)$

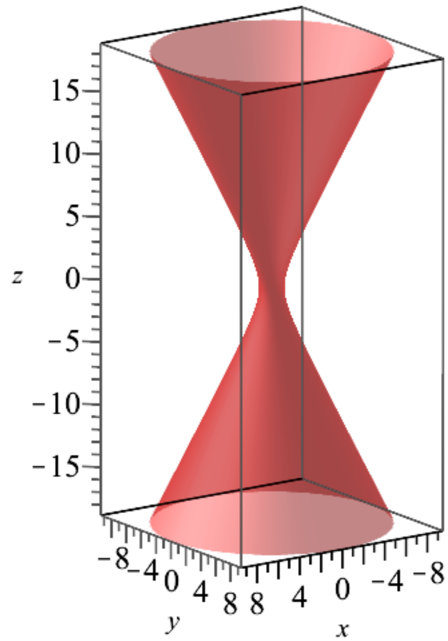


Hyperboloide:

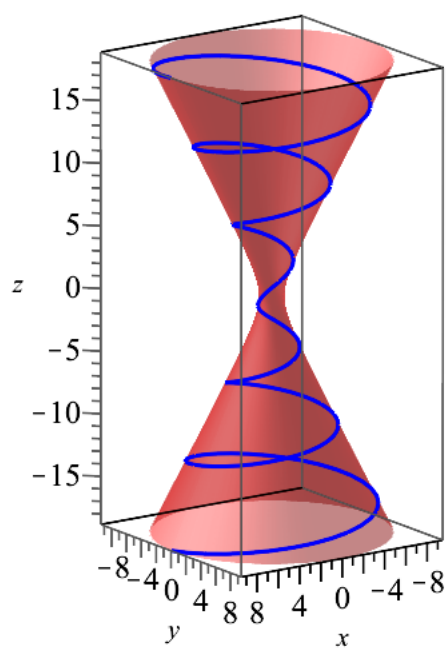
$$r_{hyperboloide}(u,v) := R_z\left(\frac{v}{c}\right).\left\langle p\cdot\sqrt{\frac{u^2}{q^2}+1}\,,0,u\right\rangle :$$

$$r_{hyperboloide}(u,v) = \begin{bmatrix} \cos\left(\frac{v}{c}\right) p\sqrt{\frac{u^2}{q^2}+1} \\ \sin\left(\frac{v}{c}\right) p\sqrt{\frac{u^2}{q^2}+1} \\ u \end{bmatrix}$$

$R_{hyperboloide} := plot3d\big(subs\big(p=1, q=2, c=1, r_{hyperboloide}(u,v)\big), u=-2\cdot\pi\cdot 3\,..2\cdot\pi\cdot 3, v=-2\cdot\pi\cdot 3\,..2\cdot\pi\cdot 3,$ $color=red, transparency=0.9, labels=[x,y,z], scaling=constrained, numpoints=10000, style$ $=patchnogrid\big)$



$display(R_{13}, R_{hyperboloide})$

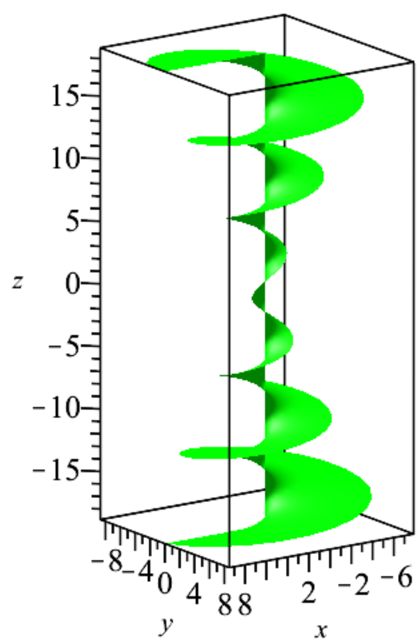


Hyperbolsk heliocoide

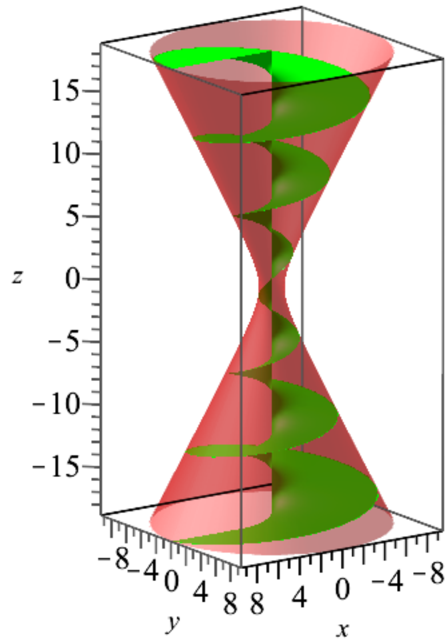
$$r_{14}(u,v) := R_z\left(\frac{v}{c}\right).\left\langle u\cdot p\cdot\sqrt{\frac{v^2}{q^2}+1}, 0, v\right\rangle :$$

$$r_{14}(u,v) = \begin{bmatrix} \cos\left(\frac{v}{c}\right) u\, p \sqrt{\frac{v^2}{q^2}+1} \\ \sin\left(\frac{v}{c}\right) u\, p \sqrt{\frac{v^2}{q^2}+1} \\ v \end{bmatrix}$$

$R_{14} := plot3d\left(subs\left(p=1, q=2, c=1, r_{14}(u,v)\right), u=0..1, v=-2\cdot\pi\cdot3..2\cdot\pi\cdot3, color=green, labels=[x,y,z], scaling=constrained, numpoints=20000, style=patchnogrid\right)$



$display\left(R_{14}, R_{hyperboloide}\right)$


15
10
5
z 0
−5
−10
−15
−8 −4 0 4 8
y
8 4 0 −4 −8
x