# Spiraler (2)

**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

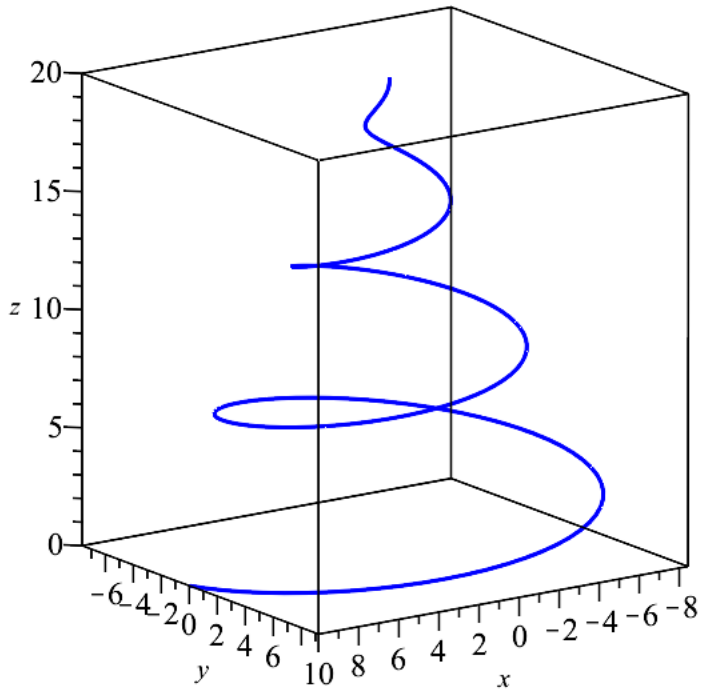
$$R_z(\theta) := \begin{bmatrix} \cos(\theta) & -\sin(\theta) & 0 \\ \sin(\theta) & \cos(\theta) & 0 \\ 0 & 0 & 1 \end{bmatrix} :$$

## Konisk helix

$$r_3(t) := R_z(t).\langle(\beta + \alpha \cdot t), 0, c \cdot t\rangle :$$

$$r_3(t) = \begin{bmatrix} \cos(t)\ (\alpha t + \beta) \\ \sin(t)\ (\alpha t + \beta) \\ c\ t \end{bmatrix}$$

$$R_3 := spacecurve\left(\left[vop\left(subs\left(\alpha = -0.5, \beta = 10, c = 1, r_3(t)\right)\right)\right], t = 0..20, color = blue, thickness = 3, labels = [x, y, z], scaling = constrained\right)$$



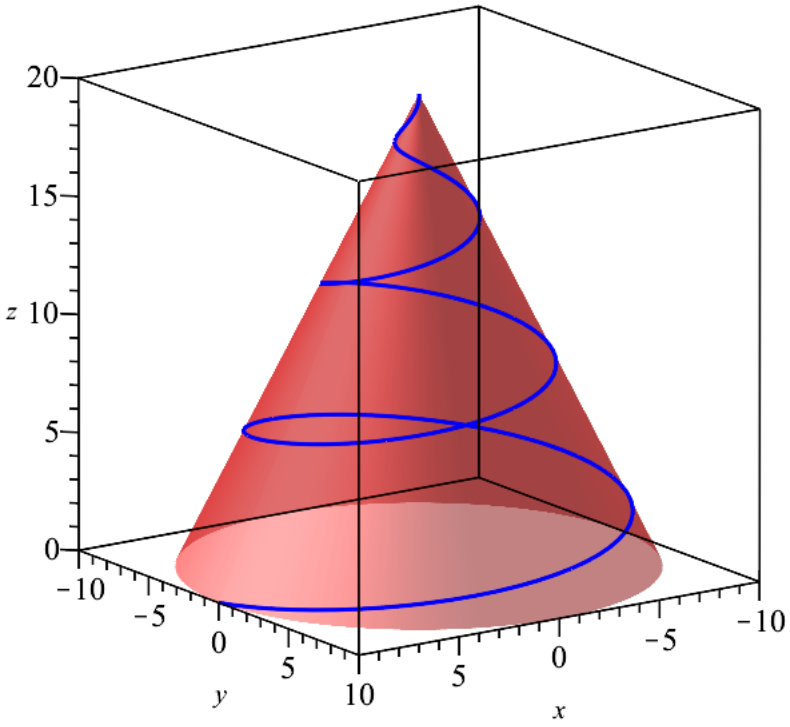

Kegle:

$r_{kegle}(u, v) := R_z(v).\langle \alpha \cdot u + \beta, 0, c \cdot u \rangle :$

$$r_{kegle}(u, v) = \begin{bmatrix} \cos(v)\ (\alpha u + \beta) \\ \sin(v)\ (\alpha u + \beta) \\ c\, u \end{bmatrix}$$

$R_{kegle} := plot3d\left(subs\left(\alpha = -0.5, \beta = 10, c = 1, r_{kegle}(u, v)\right), u = 0..20, v = 0..2 \cdot \pi \cdot 3, color = red, transparency = 0.8, labels = [x, y, z], scaling = constrained, numpoints = 10000, style = patchnogrid\right) :$

$display\left(R_3, R_{kegle}\right)$

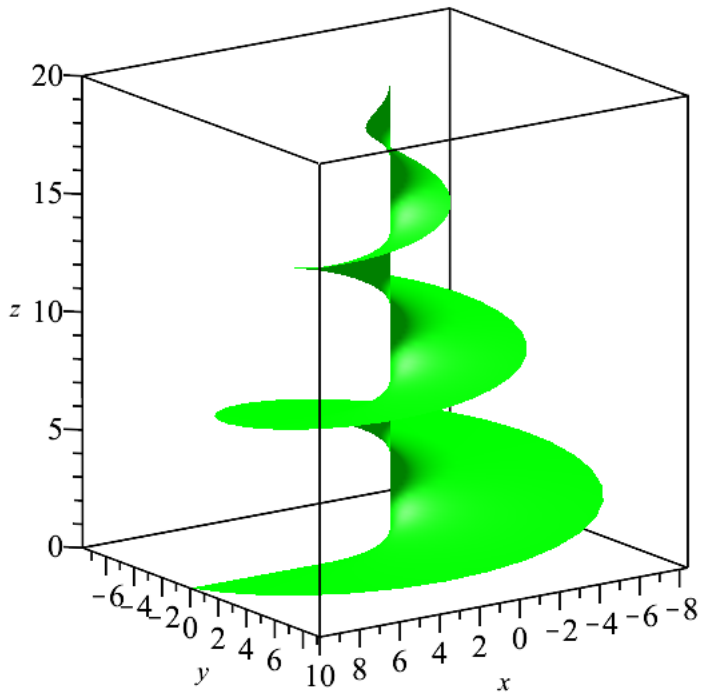



# Konisk heliocoide

$r_4(u,v) := R_z(v).\langle u\cdot(\beta+\alpha\cdot v),\ 0,\ c\cdot v\rangle$ :

$$r_4(u,v) = \begin{bmatrix} \cos(v)\ u\ (\alpha\, v+\beta) \\ \sin(v)\ u\ (\alpha\, v+\beta) \\ c\, v \end{bmatrix}$$

$R_4 := plot3d\Big(subs\big(\alpha=-0.5,\ \beta=10,\ c=1,\ r_4(u,v)\big),\ u=0..1,\ v=0..20,\ color=green,\ labels=[x,y,z],$
$scaling=constrained,\ numpoints=10000,\ style=patchnogrid\Big)$




$display(R_4, R_{kegle})$