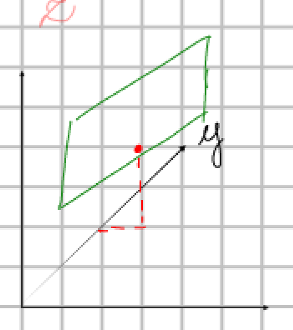
Explicit felület

$f: \underbrace{\mathbb{R}}_{x} \times \underbrace{\mathbb{R}}_{y} \to \underbrace{\mathbb{R}}_{z}$ Két dimenzió: $f: \underbrace{\mathbb{R}}_{x} \to \underbrace{\mathbb{R}}_{y}$

$\underbrace{f(x)}_{y} = \sin(x)$

$\underbrace{f(x,y)}_{z} = \sin(x) + \cos(y)$



$x_0 = 2$

$y_0 = 3$

$p = (x_0, y_0, f(x_0, y_0)) = (2, 3, f(2,3))$

ábrázolása: fsurf(f)

↳ fsurf(f,'r') → piros lesz a felület

↳ fsurf(f, [-2*pi pi 0 3]) → leszűkítés: $f: [-2\pi, \pi] \times [0,3]$

```
syms x y
f(x,y) = sin(x) + cos(y);
fsurf(f)
axis equal;
hold on;
plot3(2,3,f(2,3),'r*','MarkerSize',15)
```
} felület

```
syms x y
f(x,y) = sin(x) + cos(y);
fimplicit(f,'r','LineWidth',3)
```
→ $\sin(x) + \cos(y) = 0 \Rightarrow z = 0$ } ábra implicit alakzata → síkbeli

Kör

$x^2 + y^2 + z^2 = 0$

```
clear
syms x y z
F(x,y,z) = x^2 + y^2 + z^2 - 1;
fimplicit3 (F)
axis equal
F(1,0,0)
```
→ egy pont az alakzaton } ans = 0-nak kell lennie

síkmetszetek vannak a gömbön

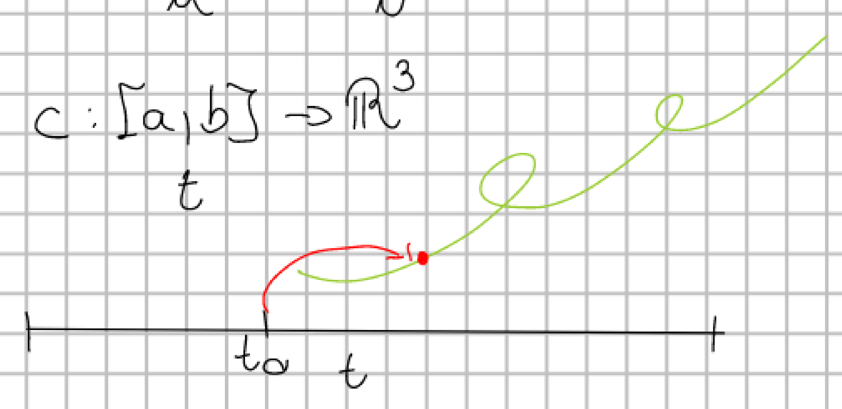
fimplicit3(F, [$\underbrace{0 \quad 1}_{x}$ $\underbrace{-1 \quad 1}_{y}$ $\underbrace{-1 \quad 1}_{z}$]) → félgömb

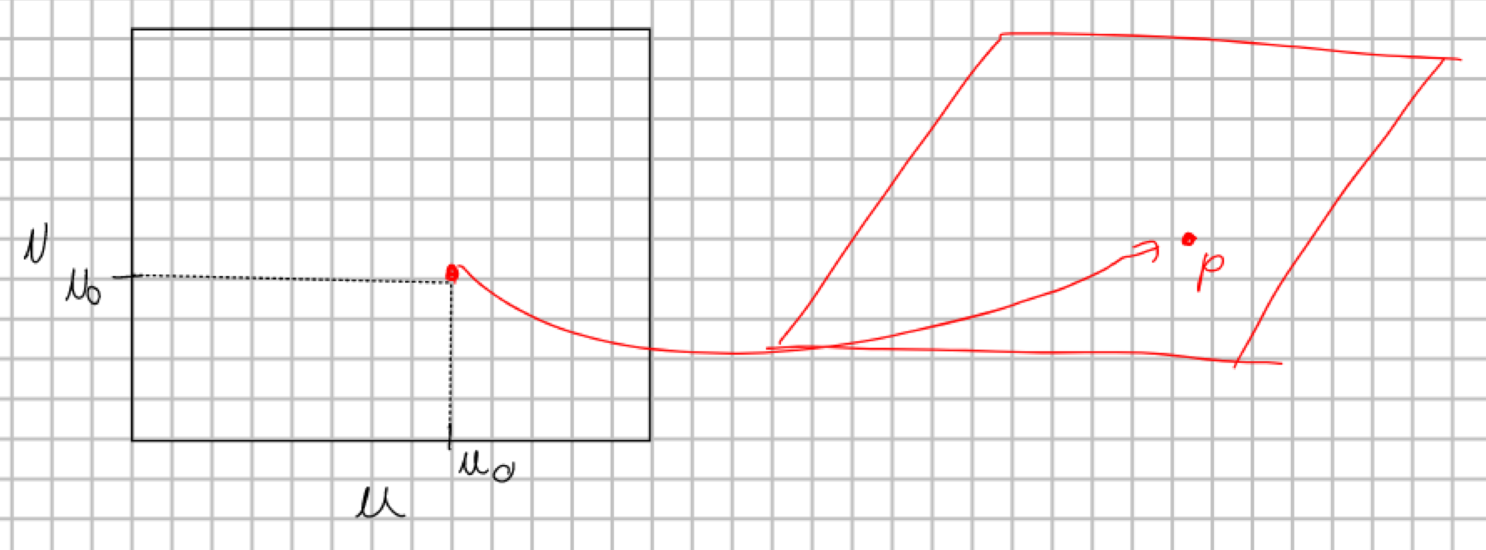
0 → negyedgömb

Paraméteres térgörbe

$s(u,v)$ $\quad s: \underset{u}{[a,b]} \times \underset{v}{[c,d]} \to \mathbb{R}^3$

$c: \underset{t}{[a,b]} \to \mathbb{R}^3$



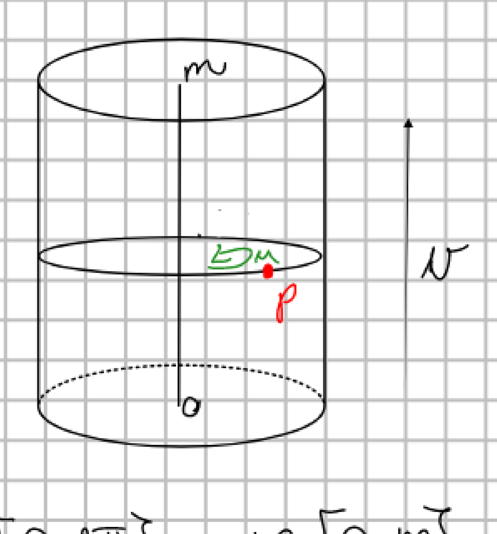


$p = (x(u_0, v_0), y(u_0, v_0), z(u_0, v_0))$ → Paraméteres felület

Henger

Alapja kör

m: magasság




```
syms u v
m = 5
x(u,v) = cos(u);
y(u,v) = sin(u);
z(u,v) = v;
fsurf(x,y,z,[0 2*pi 0 m])
axis equal;
hold on;
```
} Henger kirajzolása

```
u0 = 0.083; v0 = 0.07;
p = [x(u0,v0),y(u0,v0),z(u0,v0)]
double (p)
plot3(P(1), P(2), P(3),'.r'
```

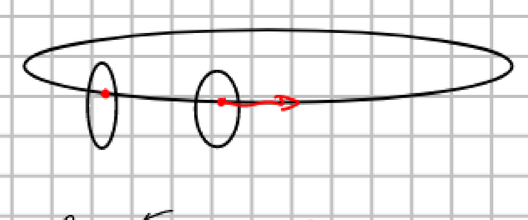
$s(u,v) \quad u \in [0, 2\pi] \quad v \in [0, m]$

$x(u,v) = \cos(u)$

$y(u,v) = \sin(u)$

$z(u,v) = m$

Tórusz



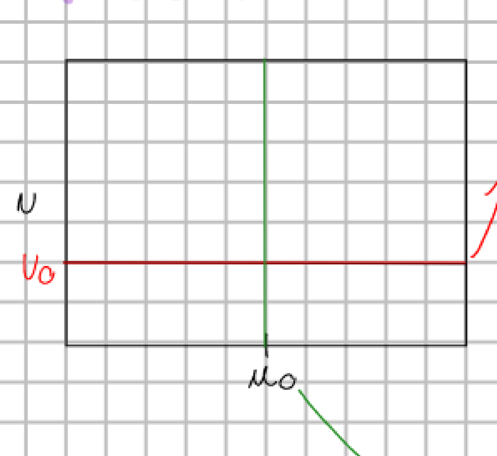
$R = 5 \quad r = 2$

$u \in [0, 2\pi]$

$v \in [0, 2\pi]$

```
clear
R=5; r=2
syms u,v
x(u,v) = (R + r * cos(v)) * cos(u);
y(u,v) = (R + r * cos(v)) * sin(u);
z(u,v) = r * sin(v)
fsurf(x,y,z,[0 2*pi 0 2*pi])
axis equal; hold on;
```

Paramétervonal



$x(u,v) = \xrightarrow{v = v_0} x(u,v) = cx(u)$

$y(u,v) = \longrightarrow y(u,v) = cy(u)$

$z(u,v) = \longrightarrow cz(u)$

$c(u) = (cx(u), cy(u), cz(u))$

$u \to u_0 \quad x(u,v) \to dx(v)$

$d(y) \quad dy(v)$

$dz(v)$

kirja milyen magasan van egy kör

```
cx(u) = x(u,v0)
cy(u) = y(u,v0)
cz(u) = z(u,v0)
fplot3(cx,cy,cz,[0 2*pi],'b','...',3)
```

Érintővektor

```
cxd(u) = diff(cx,u);
cyd(u) = diff(cy,u);
czd(u) = diff(cz,u);
ec = [cxd(u), cyd(u), czd(u)];
quiver3(P(1), P(2), P(3), ec(1), ec(2), ec(3), 'r', 'LineWidth', 3)
```

Normálvektor (jobb kéz szabály)

n = cross(ed,ec); → kifelé mutató!

KÖVETKEZŐ ÓRÁRA:

Hermit-ív (2 pont, 2 vektor) } elméletet

Bézier görbe } tudni kell