⊞—Utilities
⊞—Color utilities
⊞—pView
⊞—pMesh
⊞—Initials

Mesh plot

⊟—Color mapping Examples

Creating color maps

$$B := 3 \cdot \begin{bmatrix} -1 & 1 \\ -1 & 1 \end{bmatrix} \qquad N := \begin{bmatrix} 25 \\ 25 \end{bmatrix}$$

pShowAxis := 0

This hide the axis.

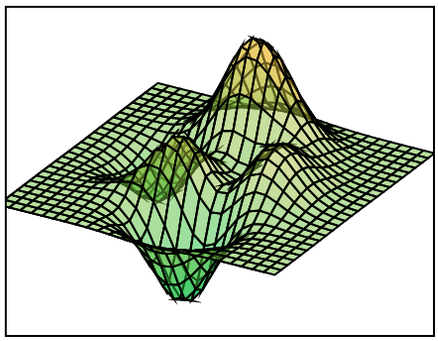
$$ml(x, y) := 3 \cdot \frac{(1-x)^2}{e^{x^2+(y+1)^2}} - 10 \cdot \frac{\frac{x}{5} - x^3 - y^5}{e^{x^2+y^2}} - \frac{1}{3 \cdot e^{(x+1)^2+y^2}}$$

$\gamma := pView2(30°, 60°)$
$S := pMesh("ml", B, N)$

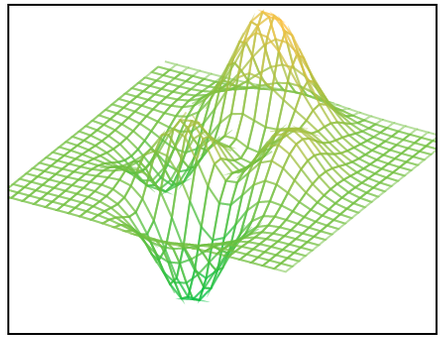
$G := pCMap([0\ 192\ 64], 10, 0.5)$ makes a colormap looking at the zero value

from $rgb([0\ 192\ 64], 0.5) = G_1 = 1$

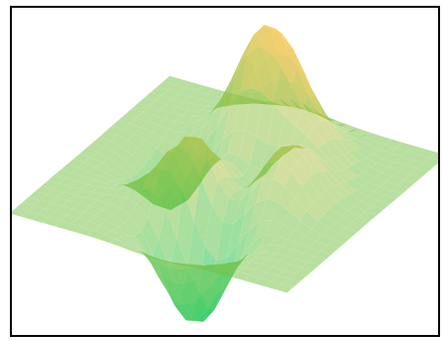
to $rgb([255\ 192\ 64], 0.5) = G_{10} = 1$



$pShow(S, N, \gamma, "black", G)$



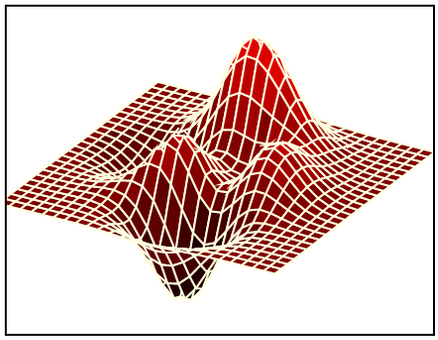
$pShow(S, N, \gamma, G, 0)$



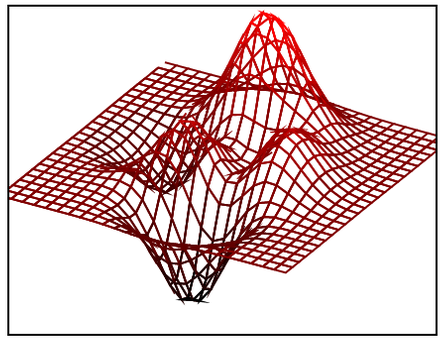
$pShow(S, N, \gamma, 0, G)$

$G := pCMap("R", 9, 1)$ Makes a colormap with a red scale. Similar for "G" and "B"

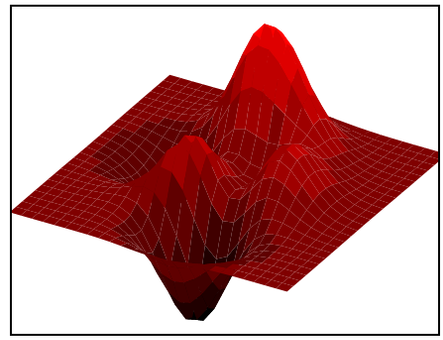
$pCMap("B", 9, 0)^T = [0\ 32\ 64\ 96\ 128\ 159\ 191\ 223\ 255]$



$pShow(S, N, \gamma, "lightyellow", G)$

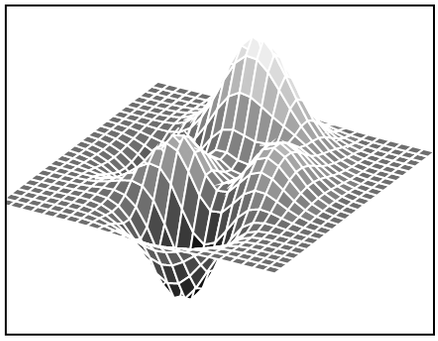


$pShow(S, N, \gamma, G, 0)$

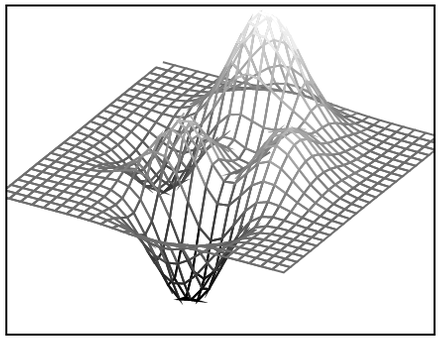


$pShow(S, N, \gamma, 0, G)$

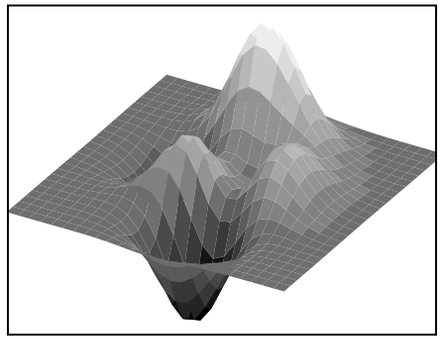
$G := pCMap\ (\text{"GS"}, 15, 1)$ Makes a colormap with 15 gray values `length(G)=15`



$pShow\ (S, N, \gamma, \text{"white"}, G)$

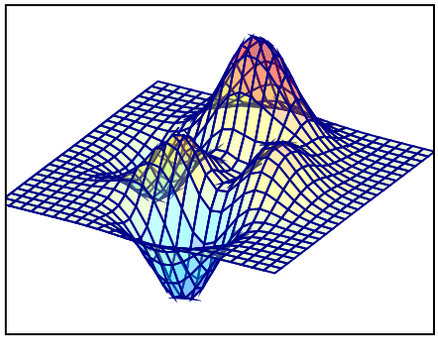


$pShow\ (S, N, \gamma, G, 0)$

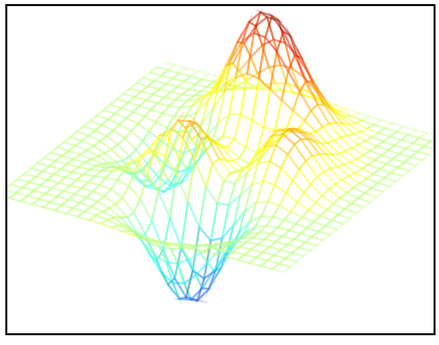


$pShow\ (S, N, \gamma, 0, G)$

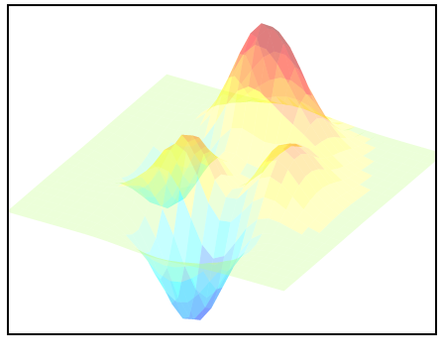
$G := pCMap\ (\text{"Jet"}, 15, 0.3)$ The Jet color map, from NASA.



$pShow\ (S, N, \gamma, \text{"darkblue"}, G)$



$pShow\ (S, N, \gamma, G, 0)$



$pShow\ (S, N, \gamma, 0, G)$

$T\ (1$

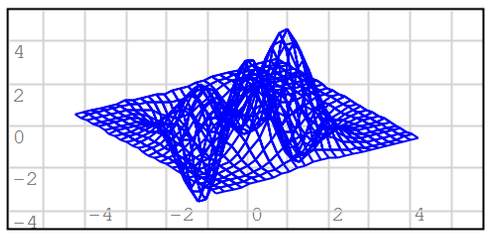
$pShowAxis := 1$

Examples of view

Examples of view

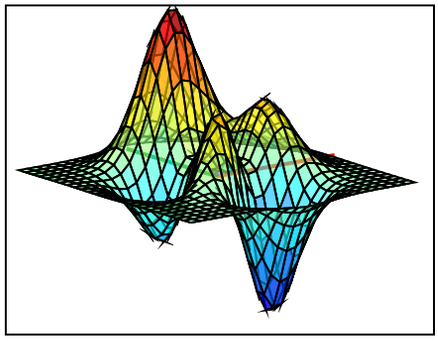
```
S := pMesh ("ml", B, N)
GM := pCMap ("black")
GS := pCMap ("Jet", 32, 0.6)
view (az, el, s) := pShow (S, s·N, pView2 (az, el), GM, GS)
```

Change the sign of N for reverse the mesh if it is necessary.



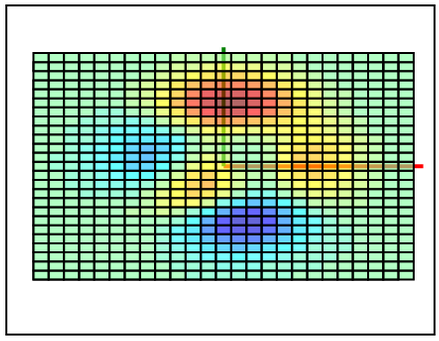
$S\ \gamma_F$

Default Matlab view



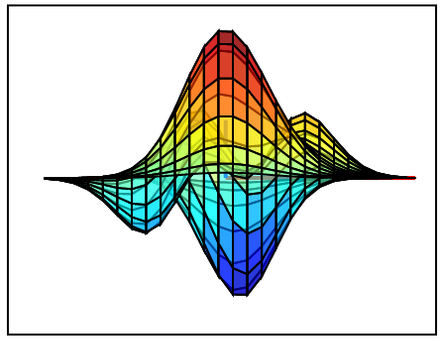
$view\ (-37.5°, 30°, -1)$

2D view



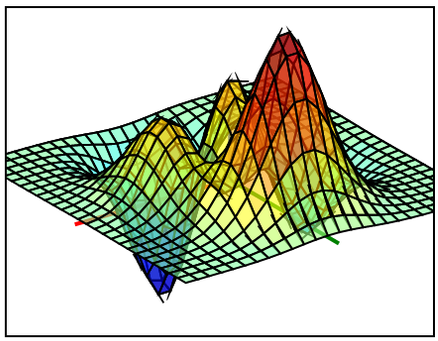
$view\ (0°, 90°, 1)$

First column view



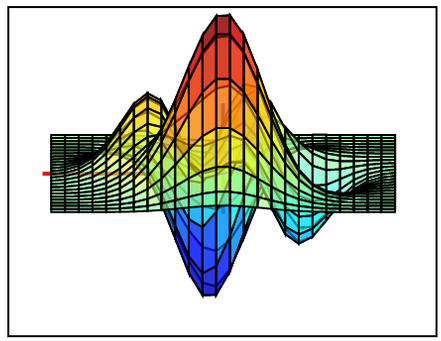
$view\ (0°, 0°, 1)$

Fridel usual view



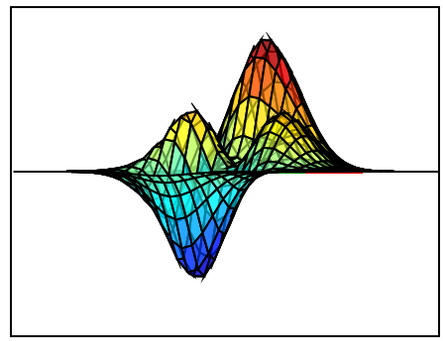
```
view(145°, 48°, 1)
```

For az = 180 is behind the matrix



```
pSort := 0
view(180°, 30°, 1)
```

Rotated first column



```
view(30°, 0°, 1)
```

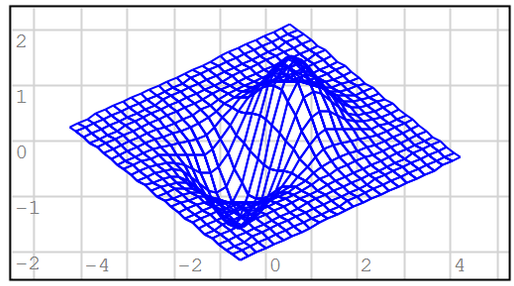
Example

Example

$$B := 3 \cdot \begin{bmatrix} -1 & 1 \\ -1 & 1 \end{bmatrix} \qquad N := 25 \cdot \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

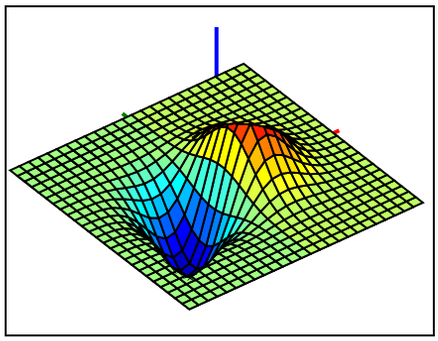
$$b(x, y) := \frac{2}{e^{(x-0.5)^2+y^2}} - \frac{2}{e^{(x+0.5)^2+y^2}}$$

```
S := pMesh("b", B, N)
GM := pCMap("black", 1, 1)
GS := pCMap("Jet", 32, 1)
γ := pView2(−37.5°, 30°)
```



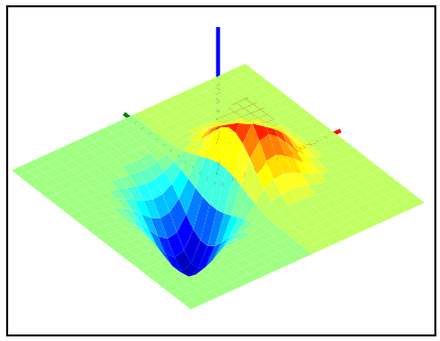
$S \cdot \gamma$

Both



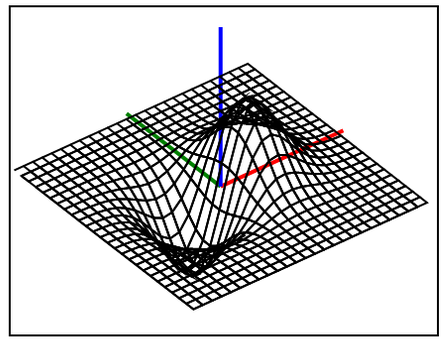
```
pShow(S, N, γ, GM, GS)
```

Only surface



```
pShow(S, N, γ, 0, GS)
```

Only mesh (without colormaping)



```
pShow(S, N, γ, GM, 0)
```

Example Need of NaN OK

Example

Using 'NaN = 0 we have an unwanted point.
This function is undefinded at (0,0)

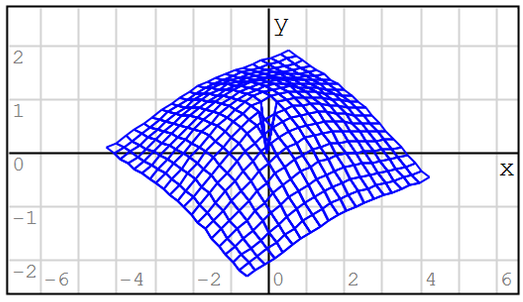
$$B := \begin{bmatrix} -3 & 3 \\ -3 & 3 \end{bmatrix} \qquad N := \begin{bmatrix} 20 \\ 20 \end{bmatrix}$$

$$f(x, y) := \frac{\sin\left(\sqrt{x^2+y^2}\right)}{\sqrt{x^2+y^2}}$$

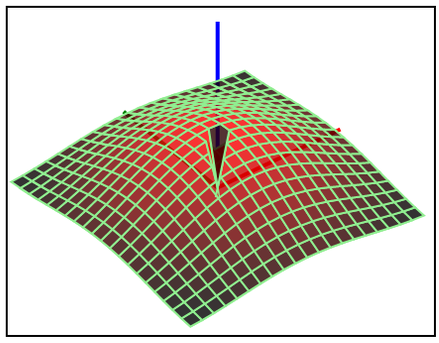
$S := pMesh("f", B, N)$
$GM := pCMap("lightgreen")$
$GS := pCMap("R", 32, 0.8)$
$\gamma := pView2(-37.5°, 30°)$

This eventually avoid the discont

$N := \begin{bmatrix} 19 \\ 19 \end{bmatrix}$

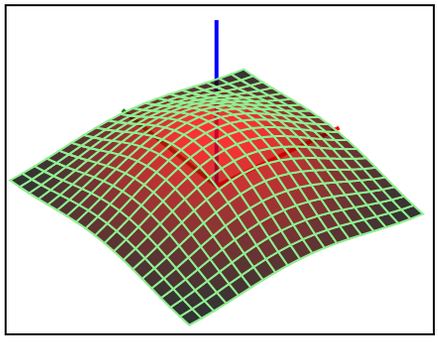


$S \cdot \gamma$

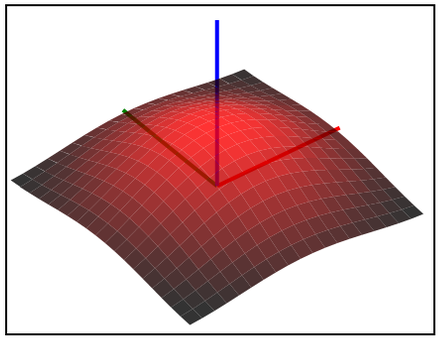


$pShow(S, N, \gamma, GM, GS)$

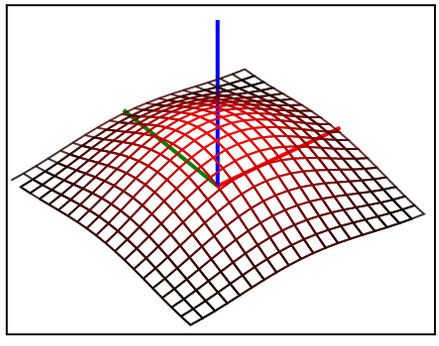
$S := pMesh("f", B, N)$



$pShow(S, N, \gamma, GM, GS)$



$pShow(S, N, \gamma, 0, GS)$



$pShow(S, N, \gamma, GS, 0)$

T

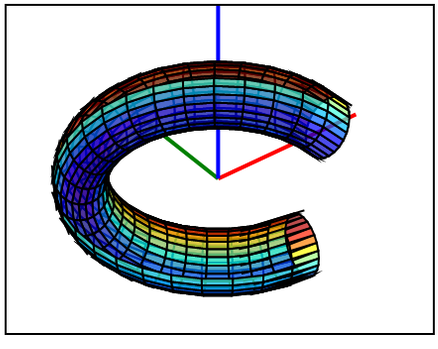
Example Torus

Example: Torus

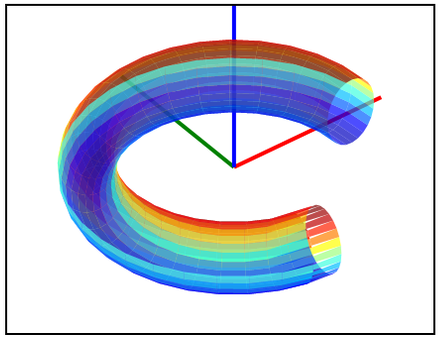
$Bt := \begin{bmatrix} 0 & 360° \\ 0 & 270° \end{bmatrix}$ $N := \begin{bmatrix} 25 \\ 25 \end{bmatrix}$ $\begin{cases} R := 5 \\ r := 1 \end{cases}$

$T(u, v) := \begin{bmatrix} (R + r \cdot \cos(u)) \cdot \cos(v) \\ (R + r \cdot \cos(u)) \cdot \sin(v) \\ r \cdot \sin(u) \end{bmatrix}$

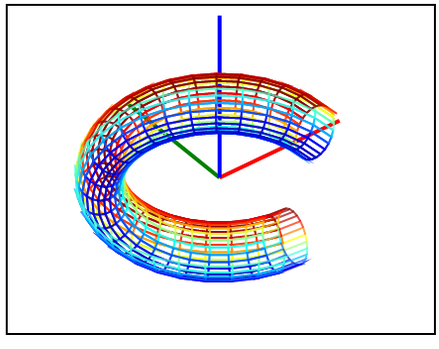
$S := pMesh("T", Bt, N)$
$GM := pCMap("black")$
$GS := pCMap("Jet", 32, 0.7)$



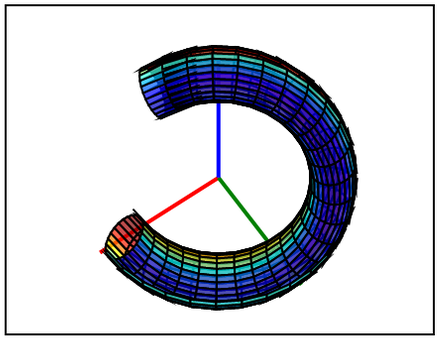
$pShow(S, N, \gamma_M, GM, GS)$



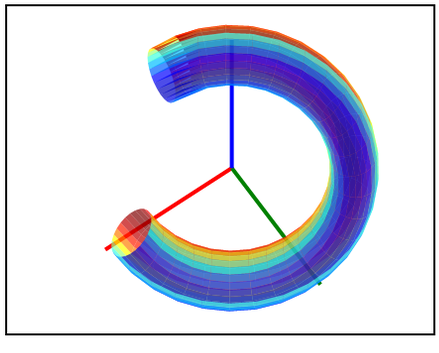
$pShow(S, N, \gamma_M, 0, GS)$



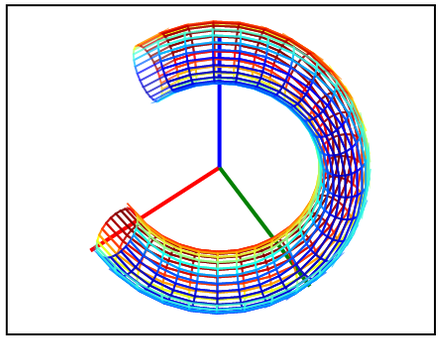
$pShow(S, N, \gamma_M, GS, 0)$



$pShow(S, N, \gamma_F, GM, GS)$



$pShow(S, N, \gamma_F, 0, GS)$



$pShow(S, N, \gamma_F, GS, 0)$

T

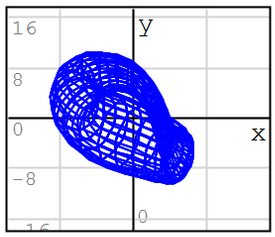
Example: Bottle ok

Example: Klein

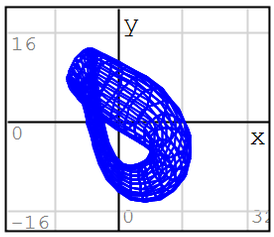
$$B := \begin{bmatrix} 0 & 2\cdot\pi \\ 0 & 2\cdot\pi \end{bmatrix} \qquad N := \begin{bmatrix} 25 \\ 25 \end{bmatrix}$$

$$K(u, v) := \left| \begin{array}{l} \left[bx := 6\cdot\cos(u)\cdot(1+\sin(u)) \quad by := 16\cdot\sin(u) \quad r := 4\cdot(1-0.5\cdot\cos(u)) \right] \\ \text{if } \pi < u \\ \quad \text{stack}(bx + r\cdot\cos(v+\pi),\ by,\ r\cdot\sin(v)) \\ \text{else} \\ \quad \text{stack}(bx + r\cdot\cos(u)\cdot\cos(v),\ by + r\cdot\sin(u)\cdot\cos(v),\ r\cdot\sin(v)) \end{array} \right.$$

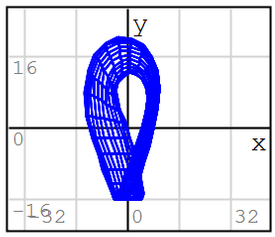
$$\begin{aligned} S &:= pMesh("K", B, N) \\ GM &:= pCMap("black") \\ GS &:= pCMap("Jet", 32, 0.6) \end{aligned}$$



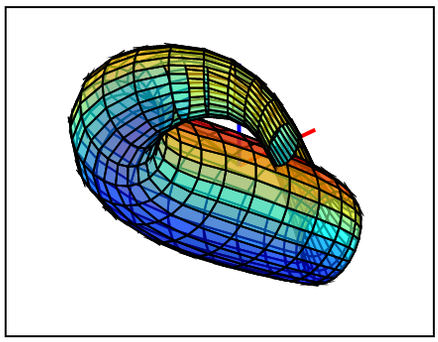
$S\ \gamma_M$



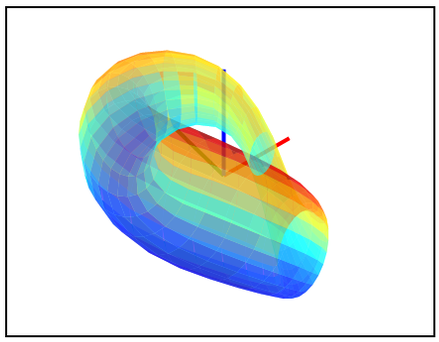
$S\ \gamma_F$



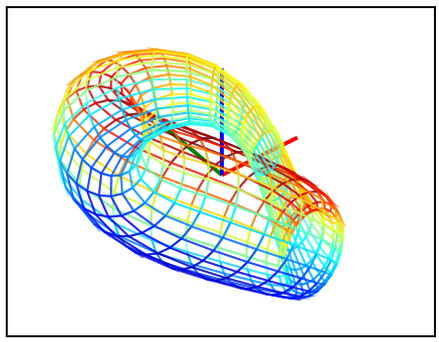
$S\ \gamma_O$



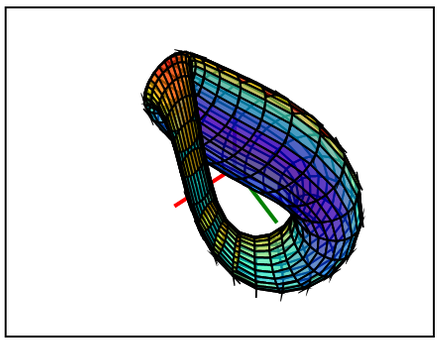
$pShow(S, -N, \gamma_M, GM, GS)$



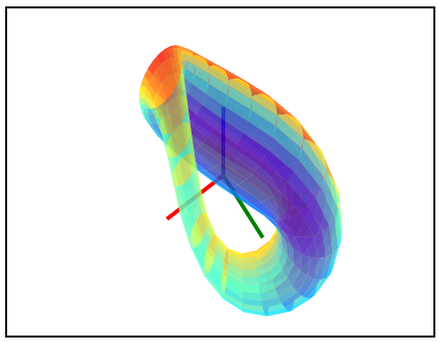
$pShow(S, -N, \gamma_M, 0, GS)$



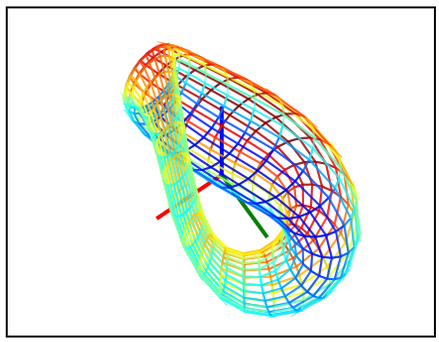
$pShow(S, -N, \gamma_M, GS, 0)$



$pShow(S, N, \gamma_F, GM, GS)$



$pShow(S, N, \gamma_F, 0, GS)$



$pShow(S, N, \gamma_F, GS, 0)$

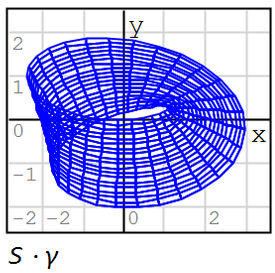
Example: Möbius ok

Example: Möbius

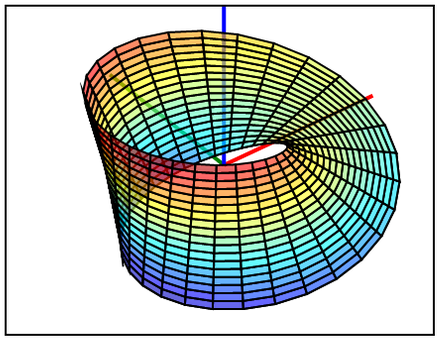
$$r := 2$$

$$f(t, s) := \begin{bmatrix} \left(r + s\cdot\cos\left(\frac{t}{2}\right)\right)\cdot\cos(t) \\ \left(r + s\cdot\cos\left(\frac{t}{2}\right)\right)\cdot\sin(t) \\ s\cdot\sin\left(\frac{t}{2}\right) \end{bmatrix}$$

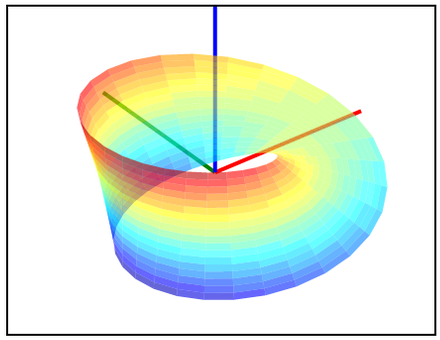
$$\left| \begin{array}{l} \left[B := \begin{bmatrix} 0 & 2\cdot\pi \\ -1 & 1 \end{bmatrix} \quad N := \begin{bmatrix} 30 \\ 18 \end{bmatrix} \right] \\ S := pMesh("f", B, N) \\ GM := pCMap("black") \\ GS := pCMap("Jet", 32, 0.6) \\ \gamma := pView2(-37.5°, 30°) \end{array} \right.$$



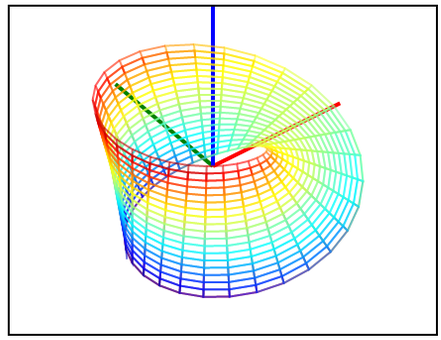
$S \cdot \gamma$



pShow (S , N , γ , GM , GS)



pShow (S , N , γ , 0 , GS)



pShow (S , N , γ , GS , 0)

T (

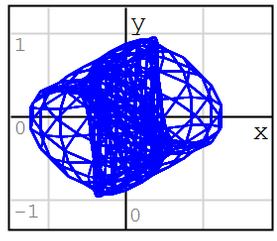
Example: Roman ok

Example: Roman

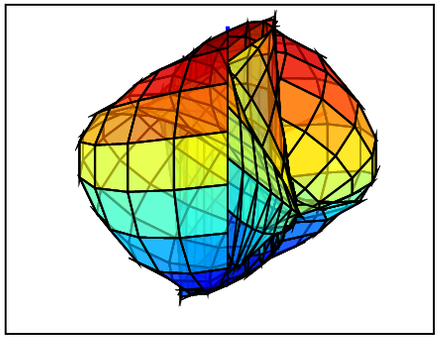
$r := 2$

$$f(u, v) := \begin{bmatrix} \sin(2 \cdot u) \cdot \sin(v)^2 \\ \sin(u) \cdot \cos(2 \cdot v) \\ \cos(u) \cdot \sin(2 \cdot v) \end{bmatrix}$$

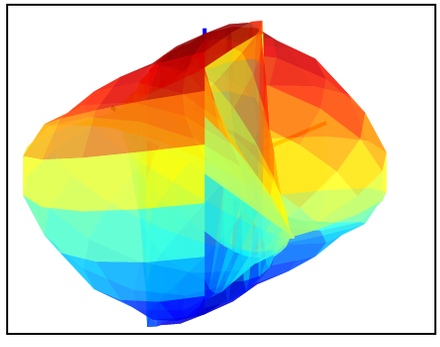
$$\left\| \begin{array}{l} B := \begin{bmatrix} 0 & 2 \cdot \pi \\ 0 & 2 \cdot \pi \end{bmatrix} \quad N := \begin{bmatrix} 30 \\ 30 \end{bmatrix} \\ S := pMesh("f", B, N) \\ GM := pCMap("black") \\ GS := pCMap("Jet", 32, 0.4) \\ \gamma := pView2(-37.5°, 30°) \end{array} \right\|$$



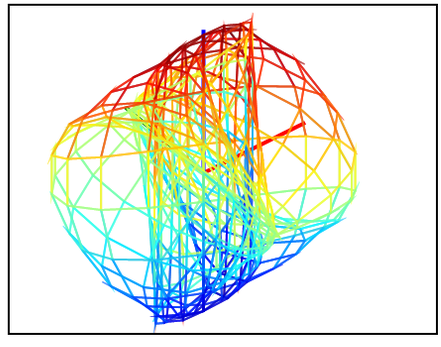
S · γ



pShow (S , N , γ , GM , GS)



pShow (S , N , γ , 0 , GS)



pShow (S , N , γ , GS , 0)

T (

TT (

Alvaro