Kvadratiske flater

Tar inn pakken `plots` først.

with(plots) :

Elliptisk paraboloide $z = x^2 + 4\,y^2$
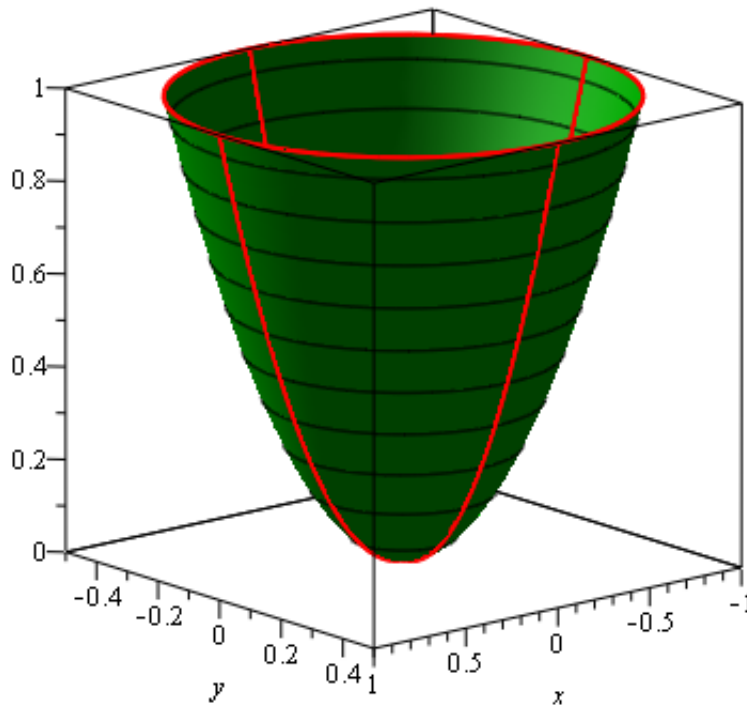
$P1 := plot3d\big(x^2 + 4\,y^2, x = -1\,..1, y = -0.5\,..0.5, style = surfacecontour, color = \text{"Green"}\big)$:
$P2 := spacecurve\big(\left[0, t, 4\cdot t^2\right], t = -0.5\,..0.5, thickness = 2, color = \text{"Red"}\big)$:
$P3 := spacecurve\big(\left[t, 0, t^2\right], t = -1\,..1, thickness = 2, color = \text{"Red"}\big)$:
$P4 := spacecurve\big(\left[\cos(t), 0.5\,\cdot\sin(t), 1\right], t = 0\,..2\cdot\text{Pi}, thickness = 2, color = \text{"Red"}\big)$:
$display(P1, P2, P3, P4, view = [\,-1\,..1, -0.5\,..0.5, 0\,..1\,], axes = boxed, orientation = [50, 75])$

Enkappet hyperboloide $x^2 + y^2 - z^2 = 1$

$EH1 := implicitplot3d\big(r^2 - z^2 = 1, r = 0\,..\text{sqrt}(2), \text{theta} = 0\,..2\cdot\text{Pi}, z = -1\,..1, coords = cylindrical,$
$\quad numpoints = 5000, style = surfacecontour, color = \text{"Green"}\big)$:

$EH2 := implicitplot3d(y = 0, x = -1.5 .. 1.5, y = -1 .. 1, z = -1 .. 1, color = "Brown")$:
$EH3 := implicitplot3d(x = 0, x = -1 .. 1, y = -1.5 .. 1.5, z = -1 .. 1, color = "Blue")$:
$EH4 := spacecurve([\cosh(t), 0, \sinh(t)], t = -0.3 \cdot Pi .. 0.3 \cdot Pi, thickness = 2, color = "Red")$:
$EH5 := spacecurve([-\cosh(t), 0, \sinh(t)], t = -0.3 \cdot Pi .. 0.3 \cdot Pi, thickness = 2, color = "Red")$:
$EH6 := spacecurve([0, \cosh(t), \sinh(t)], t = -0.3 \cdot Pi .. 0.3 \cdot Pi, thickness = 2, color = "Red")$:
$EH7 := spacecurve([0, -\cosh(t), \sinh(t)], t = -0.3 \cdot Pi .. 0.3 \cdot Pi, thickness = 2, color = "Red")$:
$EH8 := implicitplot3d(z = 0, x = -1.5 .. 1.5, y = -1.5 .. 1.5, z = -1 .. 1, color = "Grey")$:
$EH9 := spacecurve([\cos(t), \sin(t), 0], t = 0 .. 2 \cdot Pi, thickness = 2, color = "Red")$:
$display(EH1, EH2, EH3, EH4, EH5, EH6, EH7, EH8, EH9, view = [-1.5 .. 1.5, -1.5 .. 1.5, -1 .. 1], axes$
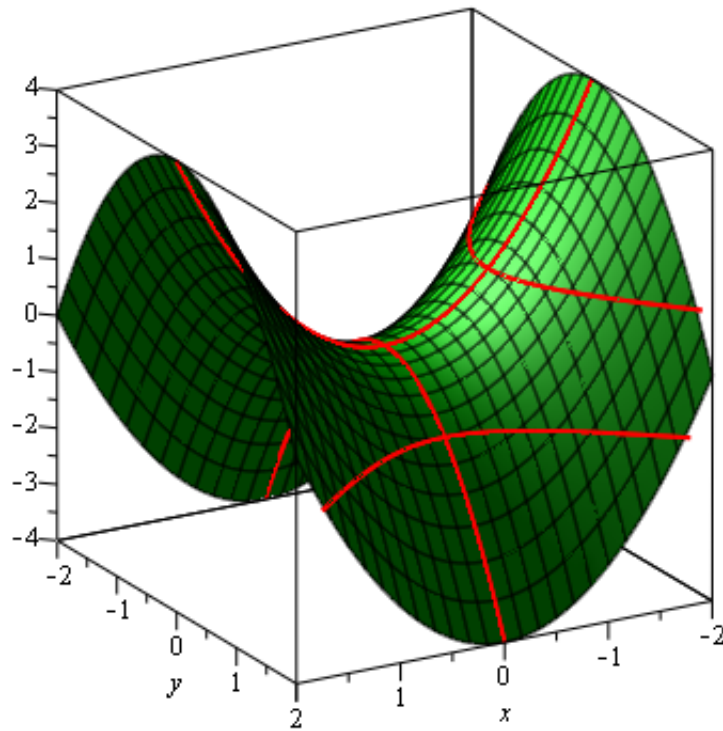$\quad = boxed, orientation = [50, 75])$
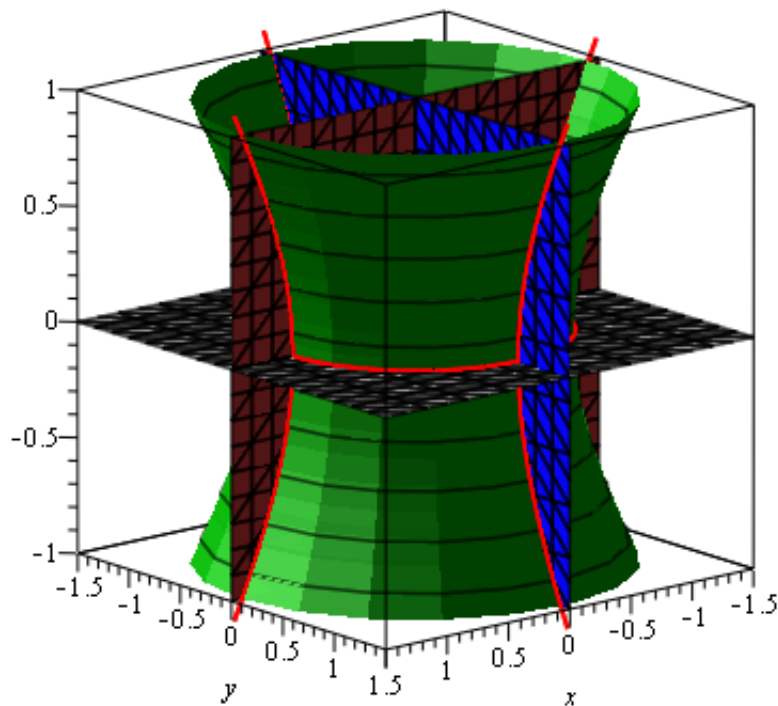
Sadelflate $z = x^2 - y^2$

$SF1 := plot3d(x^2 - y^2, x = -2 .. 2, y = -2 .. 2, color = "Green")$:
$SF2 := spacecurve([t, 0, t^2], t = -2 .. 2, thickness = 2, color = "Red")$:
$SF3 := spacecurve([0, t, -t^2], t = -2 .. 2, thickness = 2, color = "Red")$:
$SF4 := spacecurve([-\cosh(t), \sinh(t), 1], t = -0.425 \cdot Pi .. 0.425 \cdot Pi, thickness = 2, color = "Red")$:
$SF5 := spacecurve([\sinh(t), \cosh(t), -1], t = -0.425 \cdot Pi .. 0.425 \cdot Pi, thickness = 2, color = "Red")$:
$display(SF1, SF2, SF3, SF4, SF5, orientation = [60, 70], axes = boxed, view = [-2 .. 2, -2 .. 2, -4 .. 4])$

Assorterte kvadratiske flater

Ellipsiode
$f := (x, y, z) \rightarrow$ x^2 + y^2 + 2*z^2 -100;
$$(x, y, z) \rightarrow x^2 + y^2 + 2\,z^2 - 100 \tag{1}$$

Elliptisk kjegle
$f := (x, y, z) \rightarrow$ x^2 + y^2 - z^2;
$$(x, y, z) \rightarrow x^2 + y^2 - z^2 \tag{2}$$

Elliptisk paraboloide
$f := (x, y, z) \rightarrow$ x^2 + y^2 - 10*z;
$$(x, y, z) \rightarrow x^2 + y^2 - 10\,z \tag{3}$$

Tokappet hyperboloide
$f := (x, y, z) \rightarrow$ 3*x^2 + 0.8*y^2 - 2*z^2 + 1;
$$(x, y, z) \rightarrow 3\,x^2 + 0.8\,y^2 - 2\,z^2 + 1 \tag{4}$$

Enkappet hyperboloide

$f := (x, y, z) \rightarrow 3*x\char94 2 + 0.8*y\char94 2 - 2*z\char94 2 - 1;$

$$(x, y, z) \rightarrow 3\,x^2 + 0.8\,y^2 - 2\,z^2 - 1 \qquad\qquad (5)$$

Hyperbolsk paraboloide

$f := (x, y, z) \rightarrow 3*x\char94 2 - 0.8*y\char94 2 - 5*z;$

$$(x, y, z) \rightarrow 3\,x^2 + (-1)\cdot 0.8\,y^2 - 5\,z \qquad\qquad (6)$$

Og hvordan ser denne ut? (Kun ett kvadrat, behandles ikke i 10.6)

$f := (x, y, z) \rightarrow 3*x\char94 2 + 10*y - 5*z;$

$$(x, y, z) \rightarrow 3\,x^2 + 10\,y - 5\,z \qquad\qquad (7)$$

$implicitplot3d(f(x, y, z) = 0, x = -10 .. 10, y = -10 .. 10, z = -10 .. 10, numpoints = 10000, orientation = [-50, 70, 0], axes = boxed);$