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> # Blatt 7
> # Aufgabe 7.2
> restart;
> f := 1-x^2-y^2;

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$$f := -x^2 - y^2 + 1$$

(1)

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> T := mtaylor(f, [x=-1/4, y=-1/4], 2);

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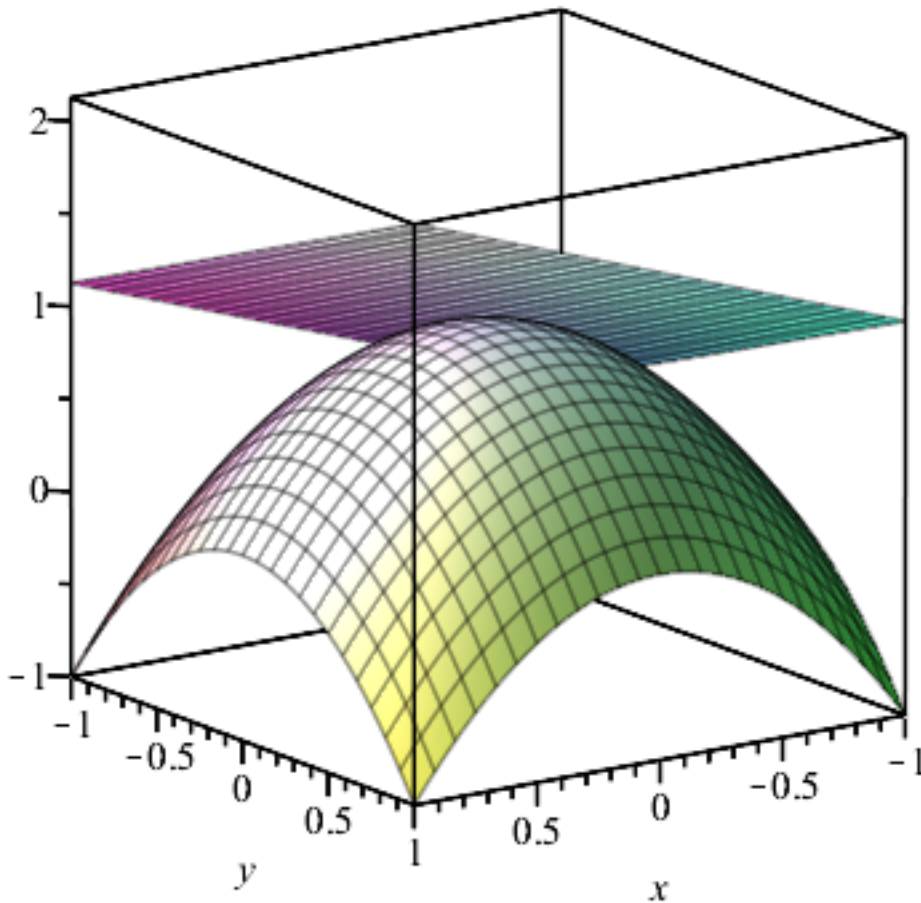
$$T := \frac{9}{8} + \frac{x}{2} + \frac{y}{2}$$

(2)

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> plot3d([f,T], x=-1..1, y=-1..1);

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> restart;
> with(VectorCalculus):
> SetCoordinates('cartesian'[x,y,z]);

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*cartesian*<sub>x,y,z</sub>

(3)

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> F := VectorField(1/(x^2+y^2+z^2)^(3/2)*<x,y,z>);

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$$F := \left( \frac{x}{(x^2 + y^2 + z^2)^{3/2}} \right) \bar{e}_x + \left( \frac{y}{(x^2 + y^2 + z^2)^{3/2}} \right) \bar{e}_y + \left( \frac{z}{(x^2 + y^2 + z^2)^{3/2}} \right) \bar{e}_z$$

(4)

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> divF := Divergence(F);

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$$\text{div}F := -\frac{3x^2}{(x^2+y^2+z^2)^{5/2}} + \frac{3}{(x^2+y^2+z^2)^{3/2}} - \frac{3y^2}{(x^2+y^2+z^2)^{5/2}} - \frac{3z^2}{(x^2+y^2+z^2)^{5/2}} \quad (5)$$

$$\text{> simplify(divF);} \quad 0 \quad (6)$$

$$\text{> Curl(F);} \quad (0)\bar{e}_x + (0)\bar{e}_y + (0)\bar{e}_z \quad (7)$$

$$\text{> f := x^2+y^2+z^2;} \quad f := x^2 + y^2 + z^2 \quad (8)$$

$$\text{> g := x+2*y+3*z-7;} \quad g := x + 2y + 3z - 7 \quad (9)$$

$$\text{> L := f+lambd*g;} \quad L := x^2 + y^2 + z^2 + \lambda(x + 2y + 3z - 7) \quad (10)$$

$$\text{> gL := Gradient(L,[x,y,z,lambd]);} \quad gL := (2x + \lambda)\bar{e}_x + (2y + 2\lambda)\bar{e}_y + (2z + 3\lambda)\bar{e}_z + (x + 2y + 3z - 7)\bar{e}_\lambda \quad (11)$$

$$\text{> solve(\{gL[1]=0,gL[2]=0,gL[3]=0,gL[4]=0\},\{x,y,z,lambd\});} \quad \left\{ \lambda = -1, x = \frac{1}{2}, y = 1, z = \frac{3}{2} \right\} \quad (12)$$

$$\text{> restart;} \quad \text{> f := (x,y) -> x^2+y^4;} \quad f := (x, y) \mapsto x^2 + y^4 \quad (13)$$

$$\text{> int(int(f(x,y),y=-sqrt(1-x^2)..sqrt(1-x^2)),x=-1..1);} \quad \frac{3\pi}{8} \quad (14)$$

$$\text{> int(int(f(r*cos(phi),r*sin(phi))*r,r=0..1),phi=0..2*Pi);} \quad \frac{3\pi}{8} \quad (15)$$