Computergestuetzte Mathematik zur Analysis

Lektion 2

▼ Unterschied Ausdruck (Expression) und Funktion (Function)

```
> r := (a * x^2 + b*x +c);
> f := x -> sin(x*Pi);
> f(1/2);
> R := unapply(r, (x, a, b, c));
> R(0, 1, -1, 3);
> int(r,x);
> int(R(x,a,b,c),x);
```

▼ Graphen von Funktionen

```
> ausdruck := sin(x);
> plot(ausdruck,x=0..2*Pi);
> plot(f,0..2);
> plot(cos, 0 .. 2*Pi);
> plot([sin(x), cos(x)], x = 0 .. 2*Pi, color = [red, green],
  thickness = 2);
> optionen := color = [red, green], thickness = 2;
> plot([tan, cot], 0 .. 2*Pi, optionen);
```
Was geht hier schief?
```
> plot([tan, cot], 0 .. 2*Pi, -10 .. 10, optionen);
> plot([tan, cot], 0 .. 2*Pi, -10 .. 10, optionen, discont =
  true);
```

▼ 3D-Funktionsgraphen

```
> f := exp(-(x^2 + y^2));
> plot3d(f, x = -3 .. 3, y = -3 .. 3);
> plot3d(f, x = -3 .. 3, y = -3 .. 3, shading = zhue, axes =
  boxed, orientation = [70, 16]);
> g := sin(x*y);
> plot3d(g, x = -2*Pi .. 2*Pi, y = -1 .. 1, axes="boxed");
> plot3d(g, x = -2*Pi .. 2*Pi, y = -1 .. 1, scaling=
  "constrained");
> plot3d(g/sqrt(x^2+y^2), x = -6..6, y = -6..6, view=-1..1,
  numpoints =1024,lightmodel=light1);
```

▼ Implizite Graphen

```
> with(plots);
> implicitplot((2*x^2+y^2-1)*(x^2+y^2-1/2),x=-1..1,y=-1..1,
  coloring=[blue,green],filledregions=true,grid=[100,100]);
> implicitplot(4*x^2-y^2-1,x=-1..1,y=-2..2,scaling="constrained")
  ;

> implicitplot3d(x^3+y^3+z^3+1 = (x+y+z+1)^3, x=-2..2, y=-2..2,
  z=-2..2,numpoints=6025);
> implicitplot3d([x^3+y^3+z^3+1 = (x+y+z+1)^3, x^2+y^2+z^2=2],x=
  -2..2,y=-2..2,z=-2..2,numpoints=6000);
> spacecurve([sin(t),cos(t),t],t=0..4*Pi);
> knot := [-10*cos(t) -2*cos(5*t) + 15*sin(2*t), 15*cos(2*t) +
  10*sin(t)-2*sin(5*t),10*cos(3*t),t=0..2*Pi]:
> spacecurve(knot,thickness=4,numpoints=600);
```

► Bewegte Bilder

```
> u:= exp(-(x-t)^2);
> animate( plot, [u,x=-8..8,thickness=3],t=0..5,trace=5,frames=50);

> animate( plot3d, [A*(x^2+y^2),x=-3..3,y=-3..3],A=-2..2,style=
  patchcontour);
> animate( implicitplot, [x^2+A*y^2=1,x=-2..2,y=-2..2],A=-2..2);
```