Computergestuetzte Mathematik zur Analysis

Lektion 2

▼ Unterschied Ausdruck (Expression) und Funktion (Function) Wiederholung

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

▼ Graphen von Funktionen

```
> ausdruck := sin(x);
> plot(ausdruck,x=0..2*Pi)
> plot(sin,0..2*Pi);
> plot(f,0..2)
> plot([ cos, sin ], 0..2*Pi,color=[red,cyan],thickness=3);
> optionen := color=[red,cyan],thickness=3;
> plot([cot, tan],0..2*Pi,optionen);
> plot([cot, tan],0..2*Pi,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=
  [-30,-60])

> g:= sin(x*y);
> plot3d(g,x=-3..3,y=-1..1);
> plot3d(g,x=-3..3,y=-1..1,scaling=constrained);

> plot3d(g/sqrt(x^2+y^2),x=-6..6,y=-6..6,view=-1..1,numpoints=
  2024,lightmodel=light4);
```

Implizite Graphen

```
> with(plots);
> implicitplot(x^2+y^2=1,x=-1..1,y=-1..1);
> implicitplot((x^2+y^2-1)*(x^2+2*y^2-1),x=-1..1,y=-1..1,scaling=
  constrained,numpoints=20000,coloring=[green,blue],
  filledregions=true);
> implicitplot3d(x^3+y^3+z^3+1=(x+y+z+1)^3, x= -2..2,y=-2..2,z=
  -2..2,numpoints=6000);
> implicitplot3d([x^3+y^3+z^3+1=(x+y+z+1)^3, x^2+y^2+z^2-1], x=
  -2..2,y=-2..2,z=-2..2,numpoints=6000);
> spacecurve([sin(t),cos(t),t],t=-6..6,thickness=6)
> 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)];
  spacecurve(knot,t=0..2*Pi,thickness=6);
```

Bewegte Bilder

```
> u:=exp( -((x-t)^2));
> animate( plot, [u,x=-10..10,thickness=3],t=0..5,trace=5,frames=
  50);
> animate( plot3d, [A*(x^2+y^2),x=-3..3,y=-3..3],A=-1..1);
> animate(implicitplot,[x^2+t*y^2=1,x=-3..3,y=-3..3], t=-1..1);
```

Mehrere Zeichnungen in einer Graphik

```
> with(plots):

  S := (x,y) -> sin(x)*(y/3)^2+x*cos(y):

> p1 := plot3d(S(x,y),x=-Pi..Pi,y=-Pi..Pi,color=gold):

  sc := spacecurve([t,t,S(t,-t)],t=-Pi..Pi,color=red,thickness=3)
  :
  su := implicitplot3d( x^2*z^2+y^2*x^2+z^2*y^2=4,
    x=-Pi..Pi,y=-Pi..Pi,z=-4..4,numpoints=5000,
    transparency=0.6,style=surface,color=blue):
> display([p1, sc, su], scaling = constrained);
>
```