Computergestuetzte Mathematik zur Analysis

Lektion 14 (4. Februar)

```
> restart:
```

Gewöhnliche Differentialgleichungen II

```
> os := diff(y(x),x$2) + y(x);
  #harmonischer Oszillator
> dsolve(os=0,y(x));
> dsolve({os=0,y(0)=1,D(y)(0)=0},y(x));
> l1 := rhs(??);
> gos:= diff(y(x),x$2) + 1/5*diff(y(x),x) + y(x);
  #harmonischer Oszillator mit Daempfung
> dsolve({gos=0,y(0)=1,D(y)(0)=0},y(x));
> l2 := rhs(??);
> plot([l1,l2],x=0..20);
```

Inhomogene Gewöhnliche Differentialgleichungen

```
> l3:=rhs(dsolve({os=sin(x),y(0)=1,D(y)(0)=0},y(x)));
> plot(l3,x=0..100); # Resonanzfall
> l4:= rhs(dsolve({os=sin(3/4*x),y(0)=1,D(y)(0)=0},y(x)));
> l5:= rhs(dsolve({os=sin(7/8*x),y(0)=1,D(y)(0)=0},y(x)));
> plot([l4,l5],x=0..100,color=[red,blue]);
```

Schwingende Membran (Bessel Funktionen)

Differentialgleichungssysteme

```
> restart:
> with(LinearAlgebra):
> A:=<<0|1|0>,<-1|0|1>,<0|0|2>>;
> T:=MatrixExponential(A,t);
> #Loesung y' = A*y , y(0) = <a,b,c>
> y0 := <a,b,c>;
> y(t) := T.y0;
> with(VectorCalculus):
> BasisFormat(false):
> diff(y(t),t) - A.y(t);
```

```
> simplify(??)
> eval(y(t),t=0);
```

Das Pendel

```
> restart;
> Dgl := diff(y(t),t$2)= -sin(y(t));
> AW:= y(0)=Pi/8,D(y)(0)=0;
> dsolve({Dgl,AW},y(t));
> Lsg:=dsolve({Dgl,AW},y(t),type=numeric,output=listprocedure);
> yl := eval(y(t),Lsg);
> yl(1);
> Dgl_os := diff(y(t),t$2) = -y(t);

> dsolve({Dgl_os,AW},y(t));
> yl_os:=unapply(rhs(??),t);
> plot([yl,yl_os],0..50,color=[black,red]);
> AW2:= y(0)=Pi/4,D(y)(0)=0;
> Lsg:=dsolve({Dgl,AW2},y(t),type=numeric,output=listprocedure);
> yl := eval(y(t),Lsg);
> dsolve({Dgl_os,AW2},y(t));
> yl_os:=unapply(rhs(??),t);
> plot([yl,yl_os],0..50,color=[black,red]);
```