

Computergestuetzte Mathematik zur Analysis

Lektion 3 (Integration und Differentiation)

Summen und Reihen (Wdh.)

```
> restart;  
> sum(j,j=0..n);  
> sum(1/j^4, j = 1 .. infinity);
```

Grenzwerte / Limes

```
> limit((1+z/n)^n,n=infinity);  
> limit( (x^2+2*x-3)/(x-1),x=1);  
> sum(1/j,j=1..n)-ln(n)  
> limit( sum(1/j,j=1..n)-ln(n),n=infinity);
```

Integration und Differentiation

```
> f:= 1/(1+t^2);  
> If := int(f,t);  
> diff(If,t);  
> int(f,t=a..b);  
> ff := x -> 1/(1+x^2);  
> int(ff,x); # Stimmt das?  
> int(ff(x),x);  
> int(ff(t),t)  
> diff(ff,x);  
> diff(ff(y),y);  
> restart;  
> f := exp(Pi*I*x)  
> diff(f,x);  
> diff(f,x,x)  
> diff(f,x$4)  
> x$4
```

Kettenregel:

```
> f:= 'f';  
> g:= 'g';  
> diff(f(g(x)),x);
```

Produktregel:

```
> diff(f(x)*g(x),x);
```

Quotientenregel:

```
> # UA
```

Dito

Verweis auf das letzte, vorletzte und vorvorletzte berechnete Ergebnis

```
> a:= 2+alpha;
```

```
> % + 2
```

```
> b:=3+beta;
```

```
> %%%
```

Traege Operatoren

```
> Limit(1/n,n=infinity);
```

```
> Sum(j,j=0..n);
```

```
> value(%%)
```

```
> value(?);
```

```
> Sum(1/j^4, j = 1 .. infinity);
```

```
> Limit((1+z/n)^n,n=infinity);
```

```
> Limit( (x^2+2*x-3)/(x-1),x=1);
```

```
> S:=Sum(1/j,j=1..n)-ln(n)
```

```
> Limit(S,n=infinity);
```

```
> value(??)
```

Differentiation II

```
> f := 1/(1+t^2);
```

```
ff := t -> 1/(1+t^2);
```

```
> Diff(ff(t),t);
```

```
> value(Diff(ff(t),t));
```

```
> diff(f,t);
```

```
> unapply(value(Diff(ff(t),t)),t);
```

```
D(ff);
```

```
> D(arctan); #Funktionsschreibweise
```

```
> f:=exp@sin; #Verkettung
```

```
> f(x);
```

```
> g:=exp@exp@exp;
```

```
> g(x);
```

```
> expand(g(x));
```

```
> G:=exp@@3;
```

```
> G-g;
```

```
> (D@@2)(f);
```

```
> expand(??(x));
```

```
> f:='f'; g:='g';  
> D(f@g);  
> expand(??(x));  
> Quotientenregel % UA
```