

```
[ > # Numa MB 2000 - Quadratur A4
```

```
[ > restart:
```

```
[ > read`quadsum_th.src`;
```

```
Summierte Formeln
```

$$SMR := hM \left(\sum_{i=1}^{nM} f \left(a + \left(i - \frac{1}{2} \right) hM \right) \right)$$

$$STR := hT \left(.5 f(a) + \left(\sum_{i=1}^{nT-1} f(a + i hT) \right) + .5 f(b) \right)$$

$$SSR := \frac{1}{6} hS \left(f(a) + 4 \left(\sum_{i=1}^{nS} f \left(a + \left(i - \frac{1}{2} \right) hS \right) \right) + 2 \left(\sum_{i=1}^{nS-1} f(a + i hS) \right) + f(b) \right)$$

```
Fehlerformeln
```

$$FSMR := \frac{1}{24} n h^3 fm2$$

$$FSMR := \frac{1}{24} hM^2 (b - a) fm2$$

$$FSTR := \frac{1}{12} n h^3 fm2$$

$$FSTR := \frac{1}{12} hT^2 (b - a) fm2$$

$$FSSR := \frac{1}{2880} n h^5 fm4$$

$$FSSR := \frac{1}{2880} hS^4 (b - a) fm4$$

```
[ > f:=x->1/x; f2:=(D@@2)(f); f4:=(D@@4)(f); a:=0.1; b:=1.0;  
IF:=int(f(x), x=a..b);
```

$$f := x \rightarrow \frac{1}{x}$$

$$f2 := x \rightarrow 2 \frac{1}{x^3}$$

$$f4 := x \rightarrow 24 \frac{1}{x^5}$$

$$a := .1$$

$$b := 1.0$$

$$IF := 2.302585093$$

```
[ > fm2:=f2(a); fm4:=f4(a);
```

$$fm2 := 2000.$$

$$fm4 := .24 10^7$$

```
[ > hm:=abs(solve(FSMR=1e-5, hM)[1]); nm:=(b-a)/hm;
```

$$hm := .0003651483717$$

$$nm := 2464.751509$$

```
[ > nM:=2465; hM:=(b-a)/nM; SMR:=SMR; FM:=abs(SMR-IF); #  
nM:=ceil((b-a)/hm)
```

```

nM := 2465
hM := .0003651115619
SMR := 2.302584543
FM := .550 10-6
> ht:=abs(solve(FSTR=1e-5,hT)[1]); nT:=ceil((b-a)/ht); hT:=(b-a)/nT;
STR:=STR; FT:=abs(STR-IF);
ht := .0002581988897
nT := 3486
hT := .0002581755594
STR := 2.302585642
FT := .549 10-6
> hs:=abs(solve(FSSR=1e-5,hS)[1]); nS:=ceil((b-a)/hs); hS:=(b-a)/nS;
SSR:=SSR; FS:=abs(SSR-IF);
hs := .01074569932
nS := 84
hS := .01071428571
SSR := 2.302585365
FS := .272 10-6
> # jetzt splitten
> unassign('hM'); a:=0.1; b:=0.4; fm2:=f2(a);
hm:=abs(solve(FSMR=0.5e-5,hM)[1]); nM1:=ceil((b-a)/hm);
a := .1
b := .4
fm2 := 2000.
hm := .0004472135955
nM1 := 671
> a:=0.4; b:=1; fm2:=f2(a); hm:=abs(solve(FSMR=0.5e-5,hM)[1]);
nM2:=ceil((b-a)/hm);
a := .4
b := 1
fm2 := 31.25000000
hm := .002529822128
nM2 := 238
> nM1+nM2<nM;
909 < 2465
> # beim ungesplitteten Intervall dominiert f2(0.1) den ganzen Bereich
=> zu kleines h
> # jetzt Trapez- und Simpson-Regel
> unassign('hT'); a:=0.1; b:=0.4; fm2:=f2(a);
ht:=abs(solve(FSTR=0.5e-5,hT)[1]); nT1:=ceil((b-a)/ht);
a := .1
b := .4
fm2 := 2000.
ht := .0003162277660

```

```

[
  > a:=0.4; b:=1; fm2:=f2(a); ht:=abs(solve(FSTR=0.5e-5,hT)[1]);
  nT2:=ceil((b-a)/ht);
  nT1 := 949
  a := .4
  b := 1
  fm2 := 31.25000000
  ht := .001788854382
  nT2 := 336
  > nT1+nT2<nT;
  1285 < 3486
  > unassign('hS'); a:=0.1; b:=0.4; fm4:=f4(a);
  hs:=abs(solve(FSSR=0.5e-5,hS)[1]); nS1:=ceil((b-a)/hs);
  a := .1
  b := .4
  fm4 := .24 107
  hs := .01189207115
  nS1 := 26
  > a:=0.4; b:=1; fm4:=f4(a); hs:=abs(solve(FSSR=0.5e-5,hS)[1]);
  nS2:=ceil((b-a)/hs);
  a := .4
  b := 1
  fm4 := 2343.750000
  hs := .05656854249
  nS2 := 11
  > nS1+nS2<nS;
  37 < 84
  >

```