Lösungen E+M1 S2 AnUe 1

L=Lektion/Leçon-- Sprechstunde/heures de consultation
W=Work/Arbeit/Travail
A =Anhang/ Annexe / Appendice

Ueb/Ex 1 W

```
Integrate[x^2, {x, 0, 1}]
```

$$\frac{1}{3}$$

```
(* Riemannsche Summe *)
Sum[1/n (k/n)^2,{k,1,n}]
```

$$\frac{(1+n)(1+2n)}{6n^2}$$

```
%//Apart
```

$$\frac{1}{3}+\frac{1}{6n^2}+\frac{1}{2n}$$

```
A = Limit[Sum[1/n (k/n)^2,{k,1,n}],n->Infinity]
```

$$\frac{1}{3}$$

Ueb/Ex 2 W

a

```
Remove["Global`*"]

f[x_]:=E^(-x^2)

Integrate[f[x], x]
```

$$\frac{1}{2}\sqrt{\pi}\,\text{Erf}[x]$$

```
Integrate[f[x],{x,-2,2}]
```

$$\sqrt{\pi}\,\text{Erf}[2]$$

```
N[%]
```

```
1.76416
```

```
NIntegrate[f[x],{x,-2,2}]
```

```
1.76416
```

```
A = Limit[2 Sum[2/n f[2 k/n],{k,1,n}],n->Infinity]
```

$$\text{Limit}\left[2 \sum_{k=1}^{n} \frac{2\, e^{-\frac{4 k^2}{n^2}}}{n},\ n \to \infty\right]$$

```
n = 10^2;
2 Sum[N[2/n f[2 k/n]],{k,1,n}]
```

```
1.74452
```

```
n = 10^3;
2 Sum[N[2/n f[2 k/n]],{k,1,n}]
```

```
1.7622
```

```
n = 10^4;
2 Sum[N[2/n f[2 k/n]],{k,1,n}]
```

```
1.76397
```

```
n = 10^5;
2 Sum[N[2/n f[2 k/n]],{k,1,n}]
```

```
1.76414
```

```
n = 10^5;
2 Sum[N[2/n f[2 k/n]],{k,1,n}]
```

```
1.76414
```

```
n = 4 10^5;
2 Sum[N[2/n f[2 k/n]],{k,1,n}]
```

```
1.76416
```

b

Series[f[x],{x,0,100}]

$$1 - x^2 + \frac{x^4}{2} - \frac{x^6}{6} + \frac{x^8}{24} - \frac{x^{10}}{120} + \frac{x^{12}}{720} - \frac{x^{14}}{5040} + \frac{x^{16}}{40320} - \frac{x^{18}}{362880} + \frac{x^{20}}{3628800} - \frac{x^{22}}{39916800} + \frac{x^{24}}{479001600} - \frac{x^{26}}{6227020800} + \frac{x^{28}}{87178291200} - \frac{x^{30}}{1307674368000} + \frac{x^{32}}{20922789888000} - \frac{x^{34}}{355687428096000} + \frac{x^{36}}{6402373705728000} - \frac{x^{38}}{121645100408832000} + \frac{x^{40}}{2432902008176640000} - \frac{x^{42}}{51090942171709440000} + \frac{x^{44}}{1124000727777607680000} - \frac{x^{46}}{25852016738884976640000} + \frac{x^{48}}{620448401733239439360000} - \frac{x^{50}}{15511210043330985984000000} + \frac{x^{52}}{403291461126605635584000000} - \frac{x^{54}}{10888869450418352160768000000} + \frac{x^{56}}{304888344611713860501504000000} - \frac{x^{58}}{8841761993739701954543616000000} + \frac{x^{60}}{265252859812191058636308480000000} - \frac{x^{62}}{8222838654177922817725562880000000} + \frac{x^{64}}{263130836933693530167218012160000000} - \frac{x^{66}}{8683317618811886495518194401280000000} + \frac{x^{68}}{295232799039604140847618609643520000000} - \frac{x^{70}}{10333147966386144929666651337523200000000} + \frac{x^{72}}{371993326789901217467999448150835200000000} - \frac{x^{74}}{13763753091226345046315979581580902400000000} + \frac{x^{76}}{523022617466601111760007224100074291200000000} - \frac{x^{78}}{20397882081197443358640281739902897356800000000} + \frac{x^{80}}{815915283247897734345611269596115894272000000000} - \frac{x^{82}}{33452526613163807108170062053440751665152000000000} + \frac{x^{84}}{1405006117752879898543142606244511569936384000000000} - \frac{x^{86}}{60415263063373835637355132068513997507264512000000000} + \frac{x^{88}}{2658271574788448768043625811014615890319638528000000000} - \frac{x^{90}}{119622220865480194561963161495657715064383733760000000000} + \frac{x^{92}}{5502622159812088949850305428800254892961651752960000000000} - \frac{x^{94}}{258623241511168180642964355153611979969197632389120000000000} + \frac{x^{96}}{12413915592536072670862289047373375038521486354677760000000000} - \frac{x^{98}}{608281864034267560872252163321295376887552831379210240000000000} + \frac{x^{100}}{30414093201713378043612608166064768844377641568960512000000000000} + O[x]^{101}$$

Normal[Series[f[x],{x,0,100}]]

$$1 - x^2 + \frac{x^4}{2} - \frac{x^6}{6} + \frac{x^8}{24} - \frac{x^{10}}{120} + \frac{x^{12}}{720} - \frac{x^{14}}{5040} + \frac{x^{16}}{40320} - \frac{x^{18}}{362880} + \frac{x^{20}}{3628800} - \frac{x^{22}}{39916800} + \frac{x^{24}}{479001600} - \frac{x^{26}}{6227020800} + \frac{x^{28}}{87178291200} - \frac{x^{30}}{1307674368000} + \frac{x^{32}}{20922789888000} - \frac{x^{34}}{355687428096000} + \frac{x^{36}}{6402373705728000} - \frac{x^{38}}{121645100408832000} + \frac{x^{40}}{2432902008176640000} - \frac{x^{42}}{51090942171709440000} + \frac{x^{44}}{1124000727777607680000} - \frac{x^{46}}{25852016738884976640000} + \frac{x^{48}}{620448401733239439360000} - \frac{x^{50}}{15511210043330985984000000} + \frac{x^{52}}{403291461126605635584000000} - \frac{x^{54}}{10888869450418352160768000000} + \frac{x^{56}}{304888344611713860501504000000} - \frac{x^{58}}{8841761993739701954543616000000} + \frac{x^{60}}{265252859812191058636308480000000} - \frac{x^{62}}{8222838654177922817725562880000000} + \frac{x^{64}}{263130836933693530167218012160000000} - \frac{x^{66}}{8683317618811886495518194401280000000} + \frac{x^{68}}{295232799039604140847618609643520000000} - \frac{x^{70}}{10333147966386144929666651337523200000000} + \frac{x^{72}}{371993326789901217467999448150835200000000} - \frac{x^{74}}{13763753091226345046315979581580902400000000} + \frac{x^{76}}{523022617466601111760007224100074291200000000} - \frac{x^{78}}{20397882081197443358640281739902897356800000000} + \frac{x^{80}}{815915283247897734345611269596115894272000000000} - \frac{x^{82}}{33452526613163807108170062053440751665152000000000} + \frac{x^{84}}{1405006117752879898543142606244511569936384000000000} - \frac{x^{86}}{60415263063373835637355132068513997507264512000000000} + \frac{x^{88}}{2658271574788448768043625811014615890319638528000000000} - \frac{x^{90}}{119622220865480194561963161495657715064383733760000000000} + \frac{x^{92}}{5502622159812088949850305428800254892961651752960000000000} - \frac{x^{94}}{258623241511168180642964355153611979969197632389120000000000} + \frac{x^{96}}{12413915592536072670862289047373375038521486354677760000000000} - \frac{x^{98}}{608281864034267560872252163321295376887552831379210240000000000} + \frac{x^{100}}{30414093201713378043612608166064768844377641568960512000000000000}$$

Integrate[Normal[Series[f[x],{x,0,10}]],{x,-2.,2.}]

0.609139

```
Integrate[Normal[Series[f[x],{x,0,20}]],{x,-2.,2.}]
```

```
1.77809
```

```
Integrate[Normal[Series[f[x],{x,0,33}]],{x,-2.,2.}]
```

```
1.76417
```

```
Integrate[Normal[Series[f[x],{x,0,35}]],{x,-2.,2.}]
```

```
1.76416
```

Ueb/Ex 3 W

a

```
Integrate[x^100 - x^99, x] + c
```

$$c - \frac{x^{100}}{100} + \frac{x^{101}}{101}$$

b

```
Sin[x]^2 + Cos[x]^2 // Simplify
```

```
1
```

```
Integrate[E^-x - Cos[x] + 1 - 1/x^2, x] + c
```

$$c - e^{-x} + \frac{1}{x} + x - \text{Sin}[x]$$

c

```
Integrate[Cosh[x] - Sinh[x], x] + c
```

$$c - \text{Cosh}[x] + \text{Sinh}[x]$$

d

```
Integrate[x^(1/3), x] + c
```

$$c + \frac{3\,x^{4/3}}{4}$$

e

```
Apart[1/(x^2-1)]
```

$$\frac{1}{2\,(-1+x)} - \frac{1}{2\,(1+x)}$$

```
Integrate[1 / (x^2 - 1) , x] + c
```

$$c + \frac{1}{2}\,\text{Log}[-1+x] - \frac{1}{2}\,\text{Log}[1+x]$$

```
1/2 (Integrate[1/(x-1) ,x] + Integrate[1/(x+1) ,x])+c
```

$$c + \frac{1}{2}\,(\text{Log}[-1+x] + \text{Log}[1+x])$$

Ueb/Ex 4 W

```
Integrate[x^2 - x^3, {x, 0, 1}]
```

$$\frac{1}{12}$$

```
N[%]
```

```
0.0833333
```

Ueb/Ex 5 W

a

```
Integrate[x Sin[x^2], x] + c
```

$$c - \frac{\text{Cos}[x^2]}{2}$$

```
Integrate[x Sin[x^2],{x,1,2}]
```

$$\frac{1}{2}\,(\text{Cos}[1] - \text{Cos}[4])$$

```
N[%]
```

```
0.596973
```

b

```
Integrate[Cosh[x],x]+c
```

$$c + \text{Sinh}[x]$$

```
Integrate[Cosh[x],{x,-1,1}]
```

$$2\,\text{Sinh}[1]$$

```
N[%]
```

```
2.3504
```

c

```
Integrate[-8 x^3 + 4 x^2 - 3 x + 1 - 2 / x, x] + c
```

$$c + x - \frac{3 x^2}{2} + \frac{4 x^3}{3} - 2 x^4 - 2 \text{Log}[x]$$

```
Integrate[-8 x^3 + 4 x^2 -3 x + 1 - 2/x,{x,2,1}]
```

$$\frac{145}{6} + \text{Log}[4]$$

```
N[%]
```

25.553

d

```
Sin[4 x - 7]^2 + Cos[4 x - 7]^2 // TrigReduce
```

1

```
Integrate[Sin[4 x - 7]^2 + Cos[4 x - 7]^2, x] + c
```

$c + x$

```
Integrate[Sin[4x-7]^2+Cos[4x-7]^2,{x,1,2}]
```

1

e

```
Integrate[1 / Cos[x]^2, x] + c
```

$c + \text{Tan}[x]$

```
Integrate[1/Cos[x]^2,{x,0,1}]
```

Tan[1]

```
N[%]
```

1.55741

f

```
Integrate[ Cos[ω x + φ], x]
```

$$\frac{\text{Cos}[x\,\omega]\,\text{Sin}[\varphi]}{\omega} + \frac{\text{Cos}[\varphi]\,\text{Sin}[x\,\omega]}{\omega}$$

```
Integrate[ Cos[ω x + φ], x] // TrigReduce
```

$$\frac{\text{Sin}[\varphi + x\,\omega]}{\omega}$$

Integrate[Cos[ω x + φ],{x,1,2}]//TrigReduce

$$\frac{-\text{Sin}[\varphi+\omega]+\text{Sin}[\varphi+2\,\omega]}{\omega}$$

g

Integrate[E^(4 x – 3) – 2 Log[4 x + 3] / (x + 3 / 4), x] + c

$$c+\frac{1}{4}\,e^{-3+4\,x}-\text{Log}[3+4\,x]^2$$

Integrate[E^(4x-3)-2 Log[4x+3]/(x+3/4),{x,1,4}]

$$\frac{1}{4}\,e\,\left(-1+e^{12}\right)+\text{Log}[7]^2-\text{Log}[19]^2$$

N[%]

110598.

h

Integrate[1 / (2 x – 3) – 10 x^20 + x^40, x] + c

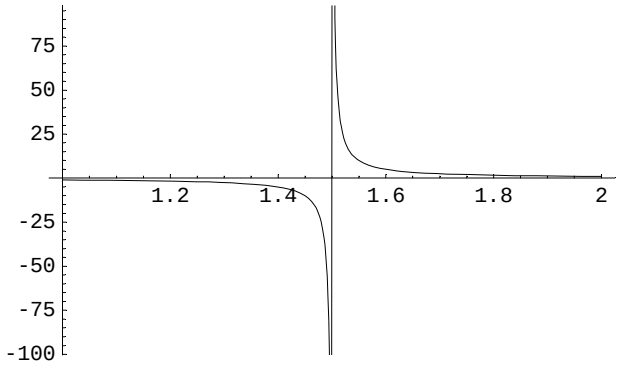
$$c-\frac{10\,x^{21}}{21}+\frac{x^{41}}{41}+\frac{1}{2}\,\text{Log}[-3+2\,x]$$

Integrate[1/(2x-3)-10 x^20+x^40,{x,1,2}]

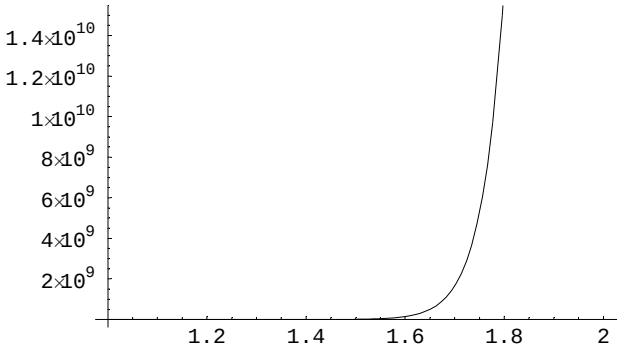
Integrate::idiv : Integral of $-10\,x^{20}+x^{40}+\frac{1}{-3+2\,x}$ does not converge on {1, 2}. Mehr…

$$\int_1^2\left(-10\,x^{20}+x^{40}+\frac{1}{-3+2\,x}\right)\,dx$$

Plot[1/(2x-3),{x,1,2}];



Plot[1/(2x-3)-10 x^20+x^40,{x,1,2}]



- Graphics **-**

Integrate[1/(2x-3)-10 x^20+x^40,{x,1,3/2-a}]
+Integrate[1/(2x-3)-10 x^20+x^40,{x,3/2+a,2}]

$$\left(\frac{1}{2}-a\right)$$

$$\text{If}\left[\text{Re}[a]\geq 0\ ||\ \text{Im}[a]\neq 0,\ -\frac{778-861\,i\,\pi}{861\,(-1+2a)}+\frac{\frac{21\,(3-2a)^{41}}{1099511627776}+\frac{205\,(-3+2a)^{21}}{524288}+861\,\text{Log}[-2a]}{861\,(1-2a)},\right.$$
$$\left.\text{Integrate}\left[-10\left(1+\left(\frac{1}{2}-a\right)x\right)^{20}+\left(1+\left(\frac{1}{2}-a\right)x\right)^{40}+\frac{1}{-3+2\,(1+(\frac{1}{2}-a)\,x)},\right.\right.$$
$$\left.\left.\{x,\,0,\,1\},\ \text{Assumptions}\to !\,(\text{Re}[a]\geq 0\ ||\ \text{Im}[a]\neq 0)\right]\right]$$

$$\left(\frac{1}{2}-a\right)\text{If}\left[\text{Re}\left[\frac{a}{1-2a}\right]\geq 0\ ||\ \text{Re}\left[\frac{a}{1-2a}\right]\leq -\frac{1}{2}\ ||\ \text{Im}\left[\frac{a}{1-2a}\right]\neq 0,\right.$$
$$-\frac{92357257068544}{861\,(-1+2a)}-\frac{5\,(3+2a)^{21}}{11010048\,(-1+2a)}-\frac{(3+2a)^{41}}{45079976738816\,(1-2a)}-\frac{\text{Log}[2]}{1-2a}-\frac{\text{Log}[a]}{1-2a},$$
$$\text{Integrate}\left[-10\left(\frac{3}{2}+a+\left(\frac{1}{2}-a\right)x\right)^{20}+\left(\frac{3}{2}+a+\left(\frac{1}{2}-a\right)x\right)^{40}+\frac{1}{-3+2\,(\frac{3}{2}+a+(\frac{1}{2}-a)\,x)},\right.$$
$$\left.\left.\{x,\,0,\,1\},\ \text{Assumptions}\to !\left(\text{Re}\left[\frac{a}{1-2a}\right]\geq 0\ ||\ \text{Re}\left[\frac{a}{1-2a}\right]\leq -\frac{1}{2}\ ||\ \text{Im}\left[\frac{a}{1-2a}\right]\neq 0\right)\right]\right]$$

Limit[Integrate[1/(2x-3)-10 x^20+x^40,{x,1,3/2-a}]
+Integrate[1/(2x-3)-10 x^20+x^40,{x,3/2+a,2}],a->0]

$$\frac{6596946933523}{123}$$

N[%]

$$5.36337\times 10^{10}$$

Ueb/Ex 6 W

f[x_] := x^2

f'[x0]

2 x0

t[x0_, x_] := f[x0] + (x - x0) f'[x0]; t[x0, x]

$2\,(x-x0)\,x0+x0^2$

```
φ[x0_] := ArcTan[(-1) / f'[x0]]; φ[x0]
```

$$-\text{ArcTan}\left[\frac{1}{2\,x0}\right]$$

```
α[x0_] := φ[x0] - 10 * 2 Pi / 360 ; α[x0]
```

$$-\frac{\pi}{18}-\text{ArcTan}\left[\frac{1}{2\,x0}\right]$$

```
Remove[nt, solv, ntx0]
```

```
nt0[x0_, x_] := f[x0] + (x - x0) Tan[φ[x0]];
```

```
nt[x0_, x_] := f[x0] + (x - x0) Tan[α[x0]];
```

```
nSolv = Solve[nt[x0, 0] == 2, {x0}] // N // Chop
```

$$\{\{x0\to 1.11515\},\{x0\to -1.32285\},\{x0\to 0.11953\}\}$$

```
solv = Solve[nt[x0, 0] == 2, {x0}]
```

$$\begin{aligned}
&\Big\{\Big\{x0\to -\Big(\text{Sec}\Big[\frac{\pi}{18}\Big]\Big(-18\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2-\text{Sin}\Big[\frac{\pi}{18}\Big]^2\Big)\Big)\Big/\\
&\quad\Big(6\Big(-135\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2\text{Sin}\Big[\frac{\pi}{18}\Big]-\text{Sin}\Big[\frac{\pi}{18}\Big]^3+3\sqrt{\Big(3\\
&\qquad\Big(-216\,\text{Cos}\Big[\frac{\pi}{18}\Big]^6+639\,\text{Cos}\Big[\frac{\pi}{18}\Big]^4\text{Sin}\Big[\frac{\pi}{18}\Big]^2+8\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2\text{Sin}\Big[\frac{\pi}{18}\Big]^4\Big)\Big)\Big)^{1/3}\Big)+\\
&\quad\frac{1}{6}\,\text{Sec}\Big[\frac{\pi}{18}\Big]\Big(-135\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2\text{Sin}\Big[\frac{\pi}{18}\Big]-\text{Sin}\Big[\frac{\pi}{18}\Big]^3+\\
&\qquad3\sqrt{\Big(3\Big(-216\,\text{Cos}\Big[\frac{\pi}{18}\Big]^6+639\,\text{Cos}\Big[\frac{\pi}{18}\Big]^4\text{Sin}\Big[\frac{\pi}{18}\Big]^2+8\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2\text{Sin}\Big[\frac{\pi}{18}\Big]^4\Big)\Big)}^{1/3}-\\
&\quad\frac{1}{6}\,\text{Tan}\Big[\frac{\pi}{18}\Big]\Big\},\Big\{x0\to\Big(\Big(1+i\sqrt{3}\Big)\text{Sec}\Big[\frac{\pi}{18}\Big]\Big(-18\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2-\text{Sin}\Big[\frac{\pi}{18}\Big]^2\Big)\Big)\Big/\\
&\quad\Big(12\Big(-135\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2\text{Sin}\Big[\frac{\pi}{18}\Big]-\text{Sin}\Big[\frac{\pi}{18}\Big]^3+\\
&\qquad3\sqrt{\Big(3\Big(-216\,\text{Cos}\Big[\frac{\pi}{18}\Big]^6+639\,\text{Cos}\Big[\frac{\pi}{18}\Big]^4\text{Sin}\Big[\frac{\pi}{18}\Big]^2+8\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2\text{Sin}\Big[\frac{\pi}{18}\Big]^4\Big)\Big)}^{1/3}\Big)-\\
&\quad\frac{1}{12}\,\Big(1-i\sqrt{3}\Big)\text{Sec}\Big[\frac{\pi}{18}\Big]\Big(-135\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2\text{Sin}\Big[\frac{\pi}{18}\Big]-\text{Sin}\Big[\frac{\pi}{18}\Big]^3+\\
&\qquad3\sqrt{\Big(3\Big(-216\,\text{Cos}\Big[\frac{\pi}{18}\Big]^6+639\,\text{Cos}\Big[\frac{\pi}{18}\Big]^4\text{Sin}\Big[\frac{\pi}{18}\Big]^2+8\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2\text{Sin}\Big[\frac{\pi}{18}\Big]^4\Big)\Big)}^{1/3}-\\
&\quad\frac{1}{6}\,\text{Tan}\Big[\frac{\pi}{18}\Big]\Big\},\Big\{x0\to\Big(\Big(1-i\sqrt{3}\Big)\text{Sec}\Big[\frac{\pi}{18}\Big]\Big(-18\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2-\text{Sin}\Big[\frac{\pi}{18}\Big]^2\Big)\Big)\Big/\\
&\quad\Big(12\Big(-135\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2\text{Sin}\Big[\frac{\pi}{18}\Big]-\text{Sin}\Big[\frac{\pi}{18}\Big]^3+\\
&\qquad3\sqrt{\Big(3\Big(-216\,\text{Cos}\Big[\frac{\pi}{18}\Big]^6+639\,\text{Cos}\Big[\frac{\pi}{18}\Big]^4\text{Sin}\Big[\frac{\pi}{18}\Big]^2+8\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2\text{Sin}\Big[\frac{\pi}{18}\Big]^4\Big)\Big)}^{1/3}\Big)-\\
&\quad\frac{1}{12}\,\Big(1+i\sqrt{3}\Big)\text{Sec}\Big[\frac{\pi}{18}\Big]\Big(-135\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2\text{Sin}\Big[\frac{\pi}{18}\Big]-\text{Sin}\Big[\frac{\pi}{18}\Big]^3+3\sqrt{\Big(3\Big(-216\,\text{Cos}\Big[\frac{\pi}{18}\Big]^6+\\
&\qquad639\,\text{Cos}\Big[\frac{\pi}{18}\Big]^4\text{Sin}\Big[\frac{\pi}{18}\Big]^2+8\,\text{Cos}\Big[\frac{\pi}{18}\Big]^2\text{Sin}\Big[\frac{\pi}{18}\Big]^4\Big)\Big)}^{1/3}-\frac{1}{6}\,\text{Tan}\Big[\frac{\pi}{18}\Big]\Big\}\Big\}
\end{aligned}$$

```
solv = Solve[nt[x0, 0] == 2, {x0}] // Flatten // N // Chop
```

$$\{x0\to 1.11515,\ x0\to -1.32285,\ x0\to 0.11953\}$$

```
solv[[2]]
```

$$x0\to -1.32285$$

```
x1 = x0 /. solv[[2]]
```

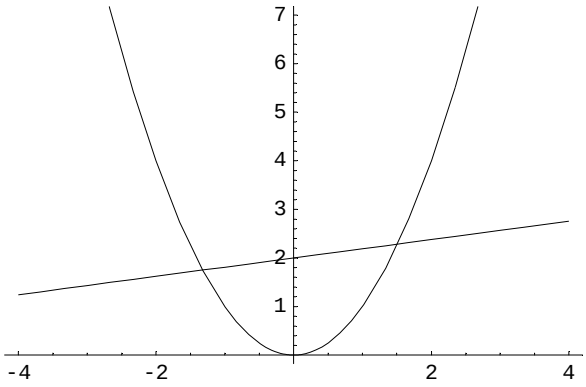
```
-1.32285
```

```
ntx0[x_] := nt[x0, x] /. solv[[2]] ; ntx0[x]
```

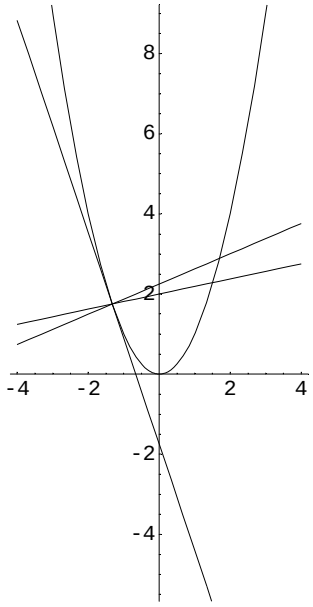
```
General::spell1 :
 Possible spelling error: new symbol name "ntx0" is similar to existing symbol "nt0". Mehr…
```

```
1.74992 + 0.189047 (1.32285 + x)
```

```
p1 = Plot[{f[x], ntx0[x]}, {x, -4, 4}];
```




```
p2 = Plot[{f[x], ntx0[x], t[x1, x], nt0[x1, x]}, {x, -4, 4},
   AspectRatio → 16 / 8];
```




```
solv2 = Solve[{f[x] == ntx0[x]}, {x}] // Flatten
```

```
{x → -1.32285, x → 1.51189}
```

```
x2 = x /. solv2[[2]]
```

```
1.51189
```

```
Integrate[ntx0[x] - f[x], {x, x1, x2}]
```

```
3.79654
```

Ueb/Ex 7 W

a

```
Integrate[x^5, {x, 3, t}]
```

$$-\frac{243}{2}+\frac{t^6}{6}$$

```
Solve[Integrate[x^5, {x, 3, t}] == 10, {t}]
```

$$\{\{t\to -789^{1/6}\},\ \{t\to 789^{1/6}\},\ \{t\to -(-1)^{1/3}\,789^{1/6}\},\ \{t\to (-1)^{1/3}\,789^{1/6}\},\ \{t\to -(-1)^{2/3}\,789^{1/6}\},\ \{t\to (-1)^{2/3}\,789^{1/6}\}\}$$

```
N[%]
```

$$\{\{t\to -3.03981\},\ \{t\to 3.03981\},\ \{t\to -1.5199-2.63255\,i\},\ \{t\to 1.5199+2.63255\,i\},\ \{t\to 1.5199-2.63255\,i\},\ \{t\to -1.5199+2.63255\,i\}\}$$

b

```
Integrate[1 / (2 x + 1), {x, 4, 6}]
```

$$\frac{1}{2}\,\text{Log}\left[\frac{13}{9}\right]$$

```
N[%]
```

```
0.183862
```

c

```
Integrate[x^2 Sin[x], {x, 0 , Pi}]
```

$$-4+\pi^2$$

```
N[%]
```

```
5.8696
```

d

```
Integrate[1 / (4 x^2 - 1), {x, 2, 4}]
```

$$\frac{1}{4}\,\text{Log}\left[\frac{35}{27}\right]$$

```
Apart[1 / (4 x^2 - 1)]
```

$$\frac{1}{2\,(-1+2\,x)}-\frac{1}{2\,(1+2\,x)}$$

```
Integrate[Apart[1 / (4 x^2 - 1)], {x, 2, 4}]
```

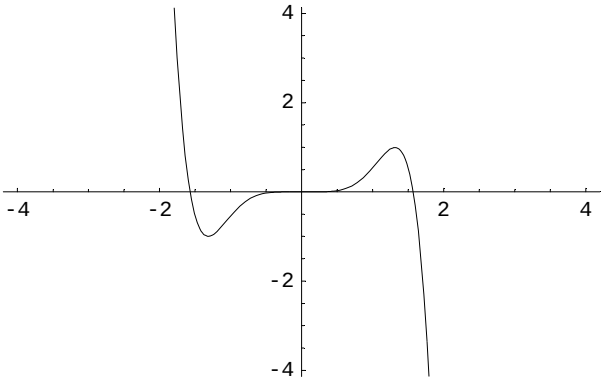
$$\frac{1}{4}\,\text{Log}\left[\frac{35}{27}\right]$$

```
N[%]
```

```
0.0648778
```

e

```
Plot[x^5 Cos[x], {x, -4, 4}];
```




```
Integrate[x^5 Cos[x], {x, -4, 4}]
```

```
0
```

f

```
Integrate[x^2 Cos[4 x^3 + 5], x]
```

$$\frac{1}{12}\,\text{Sin}[5 + 4\,x^3]$$

```
1/12 Cos[4 x^3] Sin[5] + 1/12 Cos[5] Sin[4 x^3] // TrigReduce
```

$$\frac{1}{12}\,\text{Sin}[5 + 4\,x^3]$$

g

```
Integrate[Cos[x] E^Sin[x], x]
```

$$e^{\text{Sin}[x]}$$

```
Integrate[Cos[x] E^Sin[x], {x, 0, Pi}]
```

```
0
```

```
Plot[Cos[x] E^Sin[x],{x,0,Pi}];
```