

```
> # Aufgabe 1
```

```
restart:
```

```
Kn:=0;
```

```
K0:=200*10^6;
```

```
p:=0.002:
```

```
E:=-1000000;
```

```
ZZF:=Kn=K0*(1+p)^n+E*((1+p)^n-1)/p;
```

```
nn:=solve(ZZF,n);
```

```
Kn := 0
```

```
K0 := 200000000
```

```
E := -1000000
```

$$ZZF := 0 = -3.000000000 \times 10^8 1.002^n + 5.000000000 \times 10^8$$

```
nn := 255.6681396
```

(1)

```
> restart:
```

```
Kn:=0;
```

```
K0:=200*10^6;
```

```
p:=0.002:
```

```
n:=20*12;
```

```
ZZF:=Kn=K0*(1+p)^n+E*((1+p)^n-1)/p;
```

```
EE:=solve(ZZF,E);
```

```
Kn := 0
```

```
K0 := 200000000
```

```
n := 240
```

$$ZZF := 0 = 3.230599810 \times 10^8 + 307.6499525 E$$

```
EE := -1.050089488 \times 10^6
```

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```
> # Aufgabe 2
```

```
> f:=(x,y)->x^3-x^2-x*y-y^2-x+y;
```

```
fx:=diff(f(x,y),x);
```

```
fy:=diff(f(x,y),y);
```

```
fxx:=diff(f(x,y),x,x);
```

```
fxy:=diff(f(x,y),x,y);
```

```
fyy:=diff(f(x,y),y,y);
```

$$f := (x, y) \mapsto x^3 - x^2 - y \cdot x - y^2 - x + y$$

$$fx := 3x^2 - 2x - y - 1$$

$$fy := -x - 2y + 1$$

$$fxx := 6x - 2$$

$$fxy := -1$$

$$fyy := -2$$

(3)

```
> solve({fx=0,fy=0},{x,y});
```

$$\left\{ x = -\frac{1}{2}, y = \frac{3}{4} \right\}, \{x = 1, y = 0\}$$

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> [subs(x=-0.5,fx), subs(x=-0.5,fx)*fyy-fxy^2];
[subs(x=1,fx), subs(x=1,fx)*fyy-fxy^2];
      [-5.0, 9.0]
      [4, -9]

```

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> # Aufgabe 3
> f:=x-(2*x+1)*exp(-x);
int(f(x),x);
int(f(x),x=0..2.0);
      f := x -> (2·x + 1)·e-x
      -(2 x + 3) e-x
      2.052653017

```

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```

> [f(0), f(1.), f(2.)];
S2:=evalf(1/3*(f(0)+4*f(1)+f(2)));
      [1, 1.103638324, 0.6766764160]
      S2 := 2.030409903

```

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```

> # Aufgabe 4
> restart;
with(LinearAlgebra):
A:=<<1,1,1,1><1,1,-1,-2><1,1,1,-2><1,-1,-1,1>>;
b:=<34,4,-2,-2>;
LinearSolve(A,b);
      A :=
      [ 1  1  1  1 ]
      [ 1  1  1 -1 ]
      [ 1 -1  1 -1 ]
      [ 1 -2 -2  1 ]
      b :=
      [ 34 ]
      [  4 ]
      [ -2 ]
      [ -2 ]
      [  7 ]
      [  3 ]
      [  9 ]
      [ 15 ]

```

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```

> # Aufgabe 5
> restart;

```

```
with(LinearAlgebra):  
A:=<<1,1,1>|<0,1,2>>;  
b:=<7305,7156,6935>;  
AtA:=Transpose(A).A;  
Atb:=Transpose(A).b;  
LinearSolve(AtA,Atb);
```

$$A := \begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 1 & 2 \end{bmatrix}$$

$$b := \begin{bmatrix} 7305 \\ 7156 \\ 6935 \end{bmatrix}$$

$$AtA := \begin{bmatrix} 3 & 3 \\ 3 & 5 \end{bmatrix}$$

$$Atb := \begin{bmatrix} 21396 \\ 21026 \end{bmatrix}$$

$$\begin{bmatrix} 7317 \\ -185 \end{bmatrix}$$

(9)