

Aufgabe A1

```
> b[k+2]:=0.8*b[k+1]+0.15*b[k]+200;
```

$$b_{k+2} := 0.8 b_{k+1} + 0.15 b_k + 200 \quad (1)$$

```
> b[0]:=10000;
b[1]:=8000;
for k from 0 to 1 do b[k+2]:=0.8*b[k+1]+0.15*b[k]+200; end do;
```

$$b_0 := 10000$$

$$b_1 := 8000$$

$$b_2 := 8100.00$$

$$b_3 := 7880.000 \quad (2)$$

```
> solve(g=0.8*g+0.15*g+200,g);
```

$$4000. \quad (3)$$

Aufgabe A2

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

$$f := (x, y) \mapsto \frac{1}{3} \cdot x^3 + 2 \cdot x \cdot y + y^2 - x + 2 \cdot y \quad (4)$$

```
> dx:=diff(f(x,y),x);
dy:=diff(f(x,y),y);
solve({dx=0,dy=0},{x,y});
```

$$dx := x^2 + 2y - 1$$

$$dy := 2x + 2y + 2$$

$$\{x = -1, y = 0\}, \{x = 3, y = -4\} \quad (5)$$

```
> dxx:=diff(f(x,y),x,x);
dxy:=diff(f(x,y),x,y);
dyy:=diff(f(x,y),y,y);
A:=<<subs({x=-1,y=0},dxx),subs({x=-1,y=0},dxy)>|<subs({x=-1,y=0},
dxy),subs({x=-1,y=0},dyy)>>;
A:=<<subs({x=3,y=-4},dxx),subs({x=3,y=-4},dxy)>|<subs({x=3,y=-4},
dxy),subs({x=3,y=-4},dyy)>>;
```

$$dxx := 2x$$

$$dxy := 2$$

$$dyy := 2$$

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

$$A := \begin{bmatrix} 6 & 2 \\ 2 & 2 \end{bmatrix} \quad (6)$$

Aufgabe A3

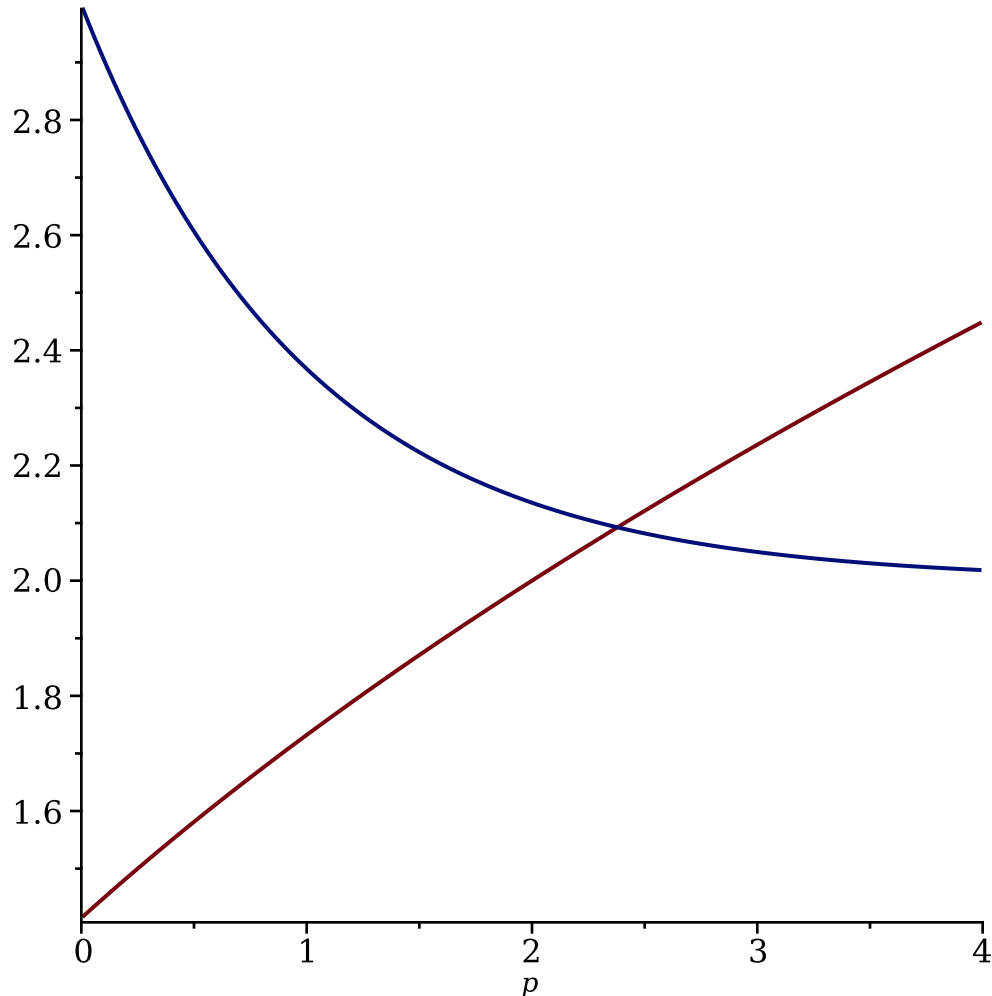
```
> restart;  
N:=p->exp(-p)+2;  
A:=p->sqrt(p+2);
```

$$N := p \mapsto e^{-p} + 2$$

$$A := p \mapsto \sqrt{p+2}$$

(7)

```
> plot({N(p),A(p)},p=0..4);
```



```
> with(LinearAlgebra):
```

```
d:=p->N(p)-A(p);
```

```
J[1]:=2;
```

```
J[2]:=3;
```

```
for k from 1 to 2 do if evalf(d((J[1]+J[2])/2)<0) then J[2]:=(J  
[1]+J[2])/2; else J[1]:=(J[1]+J[2])/2; end if;evalf(Transpose(<J  
[1],J[2]>),3);end do;
```

$$d := p \mapsto N(p) - A(p)$$

$$J_1 := 2$$

$$J_2 := 3$$

$$\begin{bmatrix} 2. & 2.50 \end{bmatrix}$$

$$\begin{bmatrix} 2.25 & 2.50 \end{bmatrix} \quad (8)$$

```
> dd:=diff(d(p),p);
x[0]:=2;
for i from 0 to 0 do x[i+1]:=evalf(x[i]-d(x[i])/subs(p=x[i],dd));
end do;
```

$$dd := -e^{-p} - \frac{1}{2\sqrt{p+2}}$$

$$x_0 := 2$$

$$x_1 := 2.351214356 \quad (9)$$

Aufgabe A4

```
> with(LinearAlgebra):
A:=<<1,-1,2,0>|<-1,-1,1,1>|<2,1,0,-1>|<1,2,1,2>>;
b:=<6,2,4,0>;
LinearSolve(A,b);
```

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

$$b := \begin{bmatrix} 6 \\ 2 \\ 4 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} -2 + 4 _t_4 \\ 8 - 9 _t_4 \\ 8 - 7 _t_4 \\ _t_4 \end{bmatrix} \quad (10)$$

Aufgabe A5

```
> A:=<<1,1,1,1>|<21,22,23,24>>;
b:=<100,107,101,112>;
AtA:=Transpose(A).A;
Atb:=Transpose(A).b;
LinearSolve(AtA,Atb);
```

$$A := \begin{bmatrix} 1 & 21 \\ 1 & 22 \\ 1 & 23 \\ 1 & 24 \end{bmatrix}$$

$$b := \begin{bmatrix} 100 \\ 107 \\ 101 \\ 112 \end{bmatrix}$$

$$AtA := \begin{bmatrix} 4 & 90 \\ 90 & 2030 \end{bmatrix}$$

$$Atb := \begin{bmatrix} 420 \\ 9465 \end{bmatrix}$$

$$\begin{bmatrix} \frac{75}{2} \\ 3 \end{bmatrix}$$

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