

Lösungen

A. Vektorrechnung

Problem 1

```

V = 1/6 Det[{{3, -1, 5}, {2, 3, 6}, {-5, -6, 4}}]

$$\frac{197}{6}$$

N[%]
32.8333

```

Problem 2

```

V = Det[{{3, -1, 5}, {2, 3, 6}, {-5, -6, z}}]
153 + 11 z
Solve[V == 50, {z}] // Flatten
{z -> -103/11}
N[%]
{z -> -9.36364}

```

Problem 3

```

len[v_] := Sqrt[v.v]
r0 = {5, 1, 3}; a = {3, -1, 5}; b = {2, 3, 6}; n = Cross[a, b]
{-21, -8, 11}
en = n / len[n]

$$\left\{ -\frac{21}{\sqrt{626}}, -4\sqrt{\frac{2}{313}}, \frac{11}{\sqrt{626}} \right\}$$

N[en]
{-0.839329, -0.319744, 0.439648}

```

Problem 4

```
r[x_, y_, z_] := {x, y, z};
```

```
ϕ[{x_, y_, z_}] := en.r[x, y, z] + d; ϕ[{x, y, z}]
```

$$d - \frac{21x}{\sqrt{626}} - 4\sqrt{\frac{2}{313}}y + \frac{11z}{\sqrt{626}}$$

```
solv3 = Solve[ϕ[r0] == 0, {d}] // Flatten
```

$$\left\{d \rightarrow 40\sqrt{\frac{2}{313}}\right\}$$

```
ϕNew[{x_, y_, z_}] := en.r[x, y, z] + d /. solv3;
```

```
ϕNew[{x, y, z}]
```

$$40\sqrt{\frac{2}{313}} - \frac{21x}{\sqrt{626}} - 4\sqrt{\frac{2}{313}}y + \frac{11z}{\sqrt{626}}$$

```
c = {3, 4, 5}
```

```
{3, 4, 5}
```

```
OP0 = {5, 1, 6}
```

```
{5, 1, 6}
```

```
Remove[g]
```

```
g[t_] := OP0 + t c; g[t]
```

```
{5 + 3 t, 1 + 4 t, 6 + 5 t}
```

```
tSg = Solve[ϕNew[g[t]] == 0, {t}] // Flatten
```

$$\left\{t \rightarrow \frac{33}{40}\right\}$$

```
Sg = g[t] /. tSg
```

$$\left\{\frac{299}{40}, \frac{43}{10}, \frac{81}{8}\right\}$$

```
N[%]
```

```
{7.475, 4.3, 10.125}
```

```
gh[t_] := OP0 + t n; gh[t]
```

```
{5 - 21 t, 1 - 8 t, 6 + 11 t}
```

```
tSh = Solve[ϕNew[gh[t]] == 0, {t}] // Flatten
```

$$\left\{t \rightarrow -\frac{33}{626}\right\}$$

```
Sh = gh[t] /. tSh
```

```
{ 3823 / 626 , 445 / 313 , 3393 / 626 }
```

```
N[%]
```

```
{6.10703, 1.42173, 5.42013}
```

```
A = 1 / 2 len[Cross[Sg - Sh, OP0 - Sh]]
```

```
3267 √33 / 5008
```

```
N[%]
```

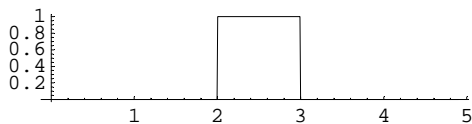
```
3.7475
```

B. Zeichnen von Funktionen und Eingabe von Matrizen in MATLAB / OCTAVE

Zeichnen von Funktionen

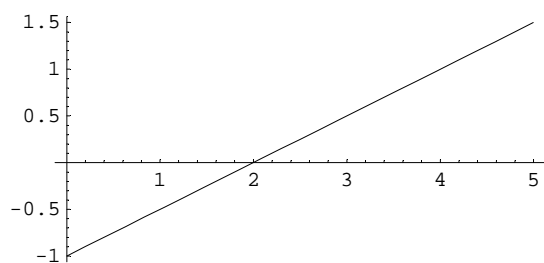
Anleitung zum Entwurf der Rechtecksfunktion (eine Möglichkeit)

Zeichne $\text{Sign}(-(x-2)(x-3))/2+0.5$

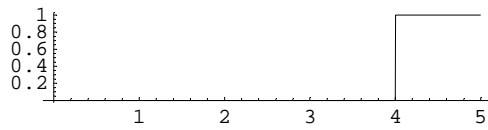


Anleitung zum Entwurf der Keilfunktion (ein möglicher Aufbau)

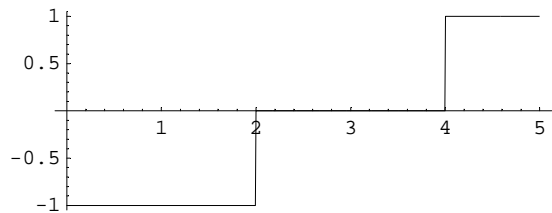
Zeichne $1/2 x - 1$



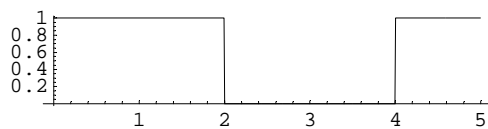
Zeichne $\text{Sign}(1/2 x - 2)/2 + 0.5$



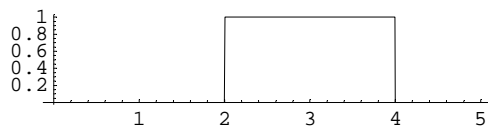
Zeichne $\text{Sign}(\lfloor 1/2 x - 1 \rfloor)$ (Gauss-Klammer)



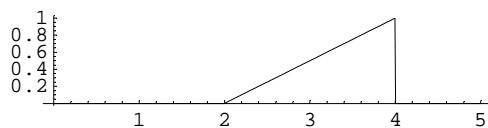
Zeichne $\text{Sign}(\lfloor 1/2 x - 1 \rfloor)^2$ (Gauss-Klammer)



Zeichne $1 - \text{Sign}(\lfloor 1/2 x - 1 \rfloor)^2$ $(1 - \text{Sign}(\lfloor 1/2 x - 1 \rfloor)^2) * (x-2)/2$

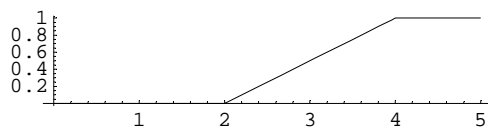


Zeichne $(1 - \text{Sign}(\lfloor 1/2 x - 1 \rfloor)^2) * (x-2)/2$



Zusammensetzen: Zeichne $(1 - \text{Sign}(\lfloor 1/2 x - 1 \rfloor)^2) * (x-2)/2 + \text{Sign}(1/2 x - 2)/2 + 0.5$

```
Plot[(1-Sign[Floor[1/2 x - 1]]^2)(x-2)/2+Sign[1/2 x - 2]
/2+0.5,{x,0,5},AspectRatio->Automatic];
```



Problem 3

Spezielle Matrizen

```
>> eye(4)
ans =

     1     0     0     0
     0     1     0     0
     0     0     1     0
     0     0     0     1

>> hadamard(4)
error: `hadamard' undefined near line 2 column 1

>> help hadamard

help: sorry, `hadamard' is not documented

>> hilb(3)
ans =

     1.00000     0.50000     0.33333
     0.50000     0.33333     0.25000
     0.33333     0.25000     0.20000

>> hilb(4)
ans =

     1.00000     0.50000     0.33333     0.25000
     0.50000     0.33333     0.25000     0.20000
     0.33333     0.25000     0.20000     0.16667
     0.25000     0.20000     0.16667     0.14286

>> magic(4)
ans =

     16     2     3     13
     5     11    10     8
     9     7     6     12
     4     14    15     1

>> ones(4,3)
ans =

     1     1     1
     1     1     1
     1     1     1
     1     1     1

>> pascal(4)
ans =

     1     1     1     1
     1     2     3     4
     1     3     6    10
     1     4    10    20
```

```
>> rand(4,5)
ans =

    0.52325    0.41896    0.37745    0.62157    0.31168
    0.48056    0.34537    0.28893    0.43059    0.16517
    0.79917    0.60014    0.89480    0.53227    0.44299
    0.21291    0.08396    0.02582    0.88215    0.00202

>> vander(4)
ans = 1

>> vander(6)
ans = 1

>> vander([1 2 3 4])
ans =

     1     1     1     1
     8     4     2     1
    27     9     3     1
    64    16     4     1
```