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
```

$$\left\{z \to -\frac{103}{11}\right\}$$

```
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}]
```

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

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

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

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

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

```
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
```

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

```
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
```

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

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

$$\left\{\frac{3823}{626}, \frac{445}{313}, \frac{3393}{626}\right\}$$

```
N[%]
```

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

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

$$\frac{3267\sqrt{33}}{5008}$$

```
N[%]
```

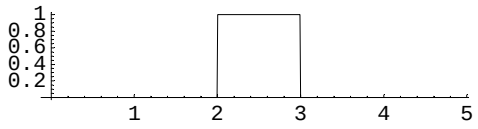
```
3.7475
```

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

Zeichnen von Funktionen

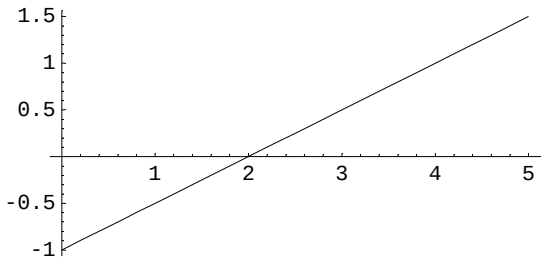
Anleitung zum Entwurf der Rechtecksfunktion (eine Möglichkeit)

Zeichne Sign(-(x-2)(x-3))/2+0.5

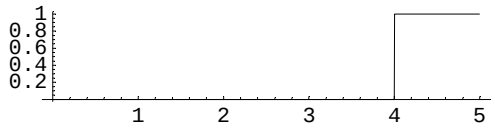


Anleitung zum Entwurf der Keilfunktion (ein möglicher Aufbau)

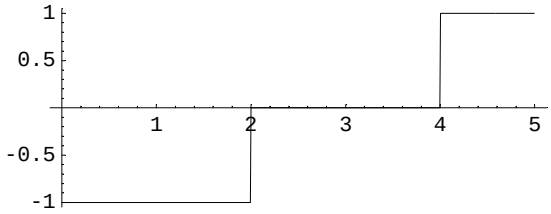
Zeichne 1/2 x -1



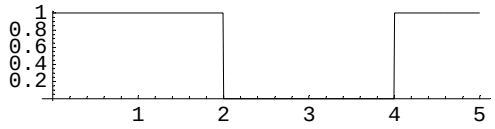
Zeichne Sign(1/2 x-2)/2+0.5



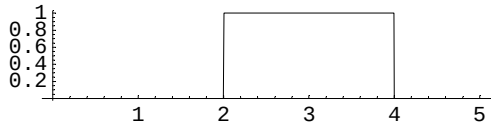
Zeichne Sign([1/2 x -1]) (Gauss-Klammer)



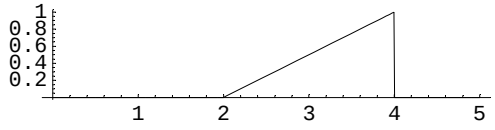
Zeichne Sign([1/2 x -1])^2 (Gauss-Klammer)



Zeichne 1 - Sign([1/2 x -1])^2 (1 - Sign([1/2 x -1])^2) * (x-2)/2

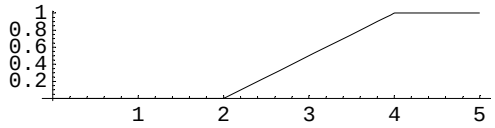


Zeichne (1 - Sign([1/2 x -1])^2) * (x-2)/2



Zusammensetzen: Zeichne (1 - Sign([1/2 x -1])^2) * (x-2)/2 + 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
```