Einführung in LaTeX
Teil II: Mathematische Formeln

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1 So bringe ich Mathematik in mein Dokument

1.1 Inline-Formeln

Seien a und b die Katheten und c die Hypotenuse, dann gilt $c = \sqrt{a^2 + b^2}$ (Lehrsatz des Pythagoras).

```
%---inline1.tex---
Seien $a$ und $b$ die Katheten
und $c$ die Hypotenuse, dann gilt
$c=\sqrt{a^2+b^2}$ (Lehrsatz des
Pythagoras).
```

Seien a und b die Katheten und c die Hypotenuse, dann gilt $c = \sqrt{a^2 + b^2}$ (Lehrsatz des Pythagoras).

```
%---inline2.tex---
Seien $a$ und $b$ die Katheten und
$c$ die Hypotenuse, dann gilt
\begin{math}c=\sqrt{a^2+b^2}\end{math}
(Lehrsatz des Pythagoras).
```

Seien a und b die Katheten und c die Hypotenuse, dann gilt $c = \sqrt{a^2 + b^2}$ (Lehrsatz des Pythagoras).

```
%---inline3.tex---
Seien $a$ und $b$ die Katheten
und $c$ die Hypotenuse, dann gilt
\( c=\sqrt{a^2+b^2} \)
(Lehrsatz des Pythagoras).
```

1.2 Abgesetzte Formeln

Seien a und b die Katheten und c die Hypotenuse, dann gilt

$$c^2 = a^2 + b^2$$

(Lehrsatz des Pythagoras).

```
%---display1.tex---
Seien $a$ und $b$ die Katheten
und $c$ die Hypotenuse, dann gilt
$$c^2=a^2+b^2$$ (Lehrsatz des
Pythagoras).
```

Seien a und b die Katheten und c die Hypotenuse, dann gilt

$c^2 = a^2 + b^2$

(Lehrsatz des Pythagoras).

```
%---display2.tex---
Seien $a$ und $b$ die Katheten und
$c$ die Hypotenuse, dann gilt
\begin{displaymath}
c^2=a^2+b^2
\end{displaymath}
(Lehrsatz des Pythagoras).
```

Seien a und b die Katheten und c die Hypotenuse, dann gilt

$c^2 = a^2 + b^2$

(Lehrsatz des Pythagoras).

```
%---display3.tex---
Seien $a$ und $b$ die Katheten und
$c$ die Hypotenuse, dann gilt
\[ c^2=a^2+b^2 \]
(Lehrsatz des Pythagoras).
```

Seien a und b die Katheten und c die Hypotenuse, dann gilt

$$c^2 = a^2 + b^2 \tag{1}$$

(Lehrsatz des Pythagoras).
Aus (1) folgt ...

```
%---display4.tex---
Seien $a$ und $b$ die Katheten
und $c$ die Hypotenuse, dann gilt
\begin{equation}\label{Pythagoras}
c^2=a^2+b^2
\end{equation}
(Lehrsatz des Pythagoras).\par
Aus (\ref{Pythagoras}) folgt \dots
```

$$f(x) = \cos x \tag{2}$$

$$f'(x) = -\sin x \tag{3}$$

$$\int_0^x f(y)dy = \sin x \tag{4}$$

```
%---display5.tex---
\begin{eqnarray}
f(x)            & = & \cos x \\
f'(x)           & = & - \sin x \\
\int_0^xf(y)dy & = & \sin x
\end{eqnarray}
```

---

2 Einige Beispiele für mathematische Formeln

2.1 Griechische Buchstaben und spezielle Zeichen

$$\mathrm{A}\mathrm{B}\Gamma\Delta\mathrm{E}\mathrm{Z}\mathrm{H}\Theta\mathrm{I}\mathrm{K}\Lambda\mathrm{M}\mathrm{N}\Xi\mathrm{O}\Pi\mathrm{P}\Sigma\mathrm{T}\Phi\mathrm{X}\mathrm{Y}\Psi\Omega$$

```
%---symbol1.tex---
\[ \mathrm{A}\mathrm{B}\Gamma\Delta
\mathrm{E}\mathrm{Z}\mathrm{H}\Theta
\mathrm{I}\mathrm{K}\Lambda\mathrm{M}
\mathrm{N}\Xi\mathrm{O}\Pi\mathrm{P}
\Sigma\mathrm{T}\Phi\mathrm{X}
\mathrm{Y}\Psi\Omega \]
```

$$\alpha\beta\gamma\delta\epsilon\zeta\eta\theta\iota\kappa\lambda\mu\nu\xi\mathrm{o}\pi\rho\sigma\tau\phi\chi\upsilon\psi\omega$$

```
%---symbol2.tex---
\[ \alpha\beta\gamma\delta\epsilon\zeta
\eta\theta\iota\kappa\lambda\mu\nu\xi
\mathrm{o}\pi\rho\sigma\tau\phi\chi
\upsilon\psi\omega \]
```

$\varepsilon \quad \vartheta \quad \varpi \quad \varrho \quad \varsigma \quad \varphi$

```
%---symbol3.tex---
\[ \varepsilon \quad \vartheta \quad
\varpi \quad \varrho \quad \varsigma
\quad \varphi \]
```

$\aleph \quad \Re \quad \Im \quad \partial \quad \infty \quad \forall \quad \exists \quad \neg \quad \heartsuit$

```
%---symbol4.tex---
\[ \aleph\quad\Re\quad\Im\quad\partial
\quad\infty\quad\forall\quad\exists
\quad\neg\quad\heartsuit \]
```

$\forall \varepsilon > 0 : |f(x_1) - f(x_2)| < \varepsilon \quad \exists \eta : |x_1 - x_2| < \eta$

```
%---symbol5.tex---
\[ \forall \varepsilon>0:
|f(x_1)-f(x_2)| < \varepsilon\quad
\exists\eta: |x_1-x_2|<\eta \]
```

2.2 Klammern

([{ [⌊ ⟨ { ⌈

```
%---klammer1.tex---
\[ (\qquad\lbrack\qquad\lbrace\qquad[
\qquad\lfloor\qquad\langle\qquad\{
\qquad\lceil \]
```

)] }] ⌋ ⟩ } ⌉

```
%---klammer2.tex---
\[ )\qquad\rbrack\qquad\rbrace\qquad]
\qquad\rfloor\qquad\rangle\qquad\}
\qquad\rceil \]
```

$$\Big((x+1)(x-1)\Big)^2$$

```
%---klammer3.tex---
\[ \Bigl( (x + 1) (x - 1)\Bigr) ^2 \]
```

$$\Big((x^2+1)(x^2-1)\Big)$$

```
%---klammer4.tex---
\[ \left((x^2 + 1) (x^2 - 1)\right) \]
```

$$1+\left(\frac{1}{1-x^2}\right)^3$$

```
%---klammer5.tex---
\[ 1 + \left(\frac{1}{1-x^2}
\right)^3 \]
```

$$\underbrace{\overbrace{a+b+\cdots+z}^{26}+\overbrace{A+B+\cdots+Z}^{26}}_{52}$$

```
%---klammer6.tex---
\[ \underbrace{
\overbrace{a+b+\cdots +z}^{26}+
\overbrace{A+B+\cdots+Z}^{26}
}_{52} \]
```

$\overline{m+n}$ $\underline{m+n}$

```
%---klammer7.tex---
\[ \overline{m+n}\qquad
\underline{m+n} \]
```

2.3 Relationen und binäre Operatoren

$x = y > z \qquad x := y \qquad x \le y \neq z$

```
%---rel1.tex---
\[ x=y>z \qquad x:=y \qquad x\le y
\ne z \]
```

$x \sim y \simeq z \qquad x \equiv y \not\equiv z \qquad x \subset y \subseteq z$

```
%---rel2.tex---
\[ x\sim y\simeq z \qquad
x\equiv y\not\equiv z \qquad
x\subset y \subseteq z \]
```

$x + y - z \qquad x * y/z \qquad x \times y \cdot z$

```
%---rel3.tex---
\[ x+y-z \qquad x*y/z \qquad
x\times y\cdot z \]
```

$x \circ y \bullet z \qquad x \cup y \cap z \qquad x \sqcup y \sqcap z$

```
%---rel4.tex---
\[ x\circ y\bullet z\qquad
x\cup y\cap z \qquad
x\sqcup y\sqcap z \qquad \]
```

$x \vee y \wedge z \qquad x \pm y \mp z$

```
%---rel5.tex---
\[ x\vee y\wedge z\qquad x\pm y\mp z \]
```

2.4 Mathematische Akzente und Vektoren

$\hat{a}$ $\check{b}$ $\tilde{c}$ $\acute{d}$ $\grave{e}$

$\dot{f}$ $\ddot{g}$ $\breve{h}$ $\bar{k}$ $\vec{l}$

```
%---akzent1.tex---
\[ \hat a \qquad \check b \qquad \tilde
c \qquad \acute d \qquad \grave e \]
\[ \dot f \qquad \ddot g \qquad \breve
h \qquad \bar k \qquad \vec l \]
```

$\hat{\imath}$ $\check{\jmath}$

```
%---akzent2.tex---
\[ \hat\imath \qquad \check\jmath \]
```

$\widehat{x}$ $\widehat{xy}$ $\widehat{xyz}$

$\widetilde{x}$ $\widetilde{xy}$ $\widetilde{xyz}$

```
%---akzent3.tex---
\[ \widehat x\qquad \widehat{xy}\qquad
\widehat{xyz} \]
\[ \widetilde x \qquad \widetilde{xy}
\qquad \widetilde{xyz} \]
```

$$\alpha\cdot(\vec x+\vec y)=\alpha\cdot\vec x+\alpha\cdot\vec y$$

```
%---akzent4.tex---
\[ \alpha\cdot(\vec x + \vec y) =
\alpha\cdot\vec x+\alpha\cdot\vec y \]
```

$$\vec x\cdot(\vec y\cdot\vec z)\neq(\vec x\cdot\vec y)\cdot\vec z$$

$$\vec x\times(\vec y\times\vec z)\neq(\vec x\times\vec y)\times\vec z$$

```
%---akzent5.tex---
\[ \vec x\cdot(\vec y\cdot \vec z)\not=
(\vec x \cdot\vec y)\cdot\vec z \]
\[ \vec x\times(\vec y\times\vec z)\not=
(\vec x\times\vec y)\times\vec z \]
```

2.5 Pfeile

$\leftarrow \quad \Leftarrow \quad \leftrightarrow \quad \Leftrightarrow \quad \uparrow \quad \downarrow \quad \nearrow$

$\longleftarrow \quad \leftharpoonup \quad \mapsto \quad \rightsquigarrow$

```
%---pfeil1.tex---
\[ \leftarrow\qquad\Leftarrow\qquad
\leftrightarrow\qquad\Leftrightarrow
\qquad\uparrow\qquad\downarrow\qquad
\nearrow \]
\[ \longleftarrow\qquad\leftharpoonup
\qquad\mapsto\qquad\leadsto \]
```

$$(\mathcal{A} \Rightarrow \mathcal{B}) \Longleftrightarrow (\neg\mathcal{B} \Rightarrow \neg\mathcal{A})$$

```
%---pfeil2.tex---
\[ (\mathcal{A}\Rightarrow\mathcal{B})
\Longleftrightarrow (\lnot \mathcal{B}
\Rightarrow \lnot \mathcal{A}) \]
```

2.6 Andere Schriften

$\forall x \in \mathbf{R} : x^2 \geq 0$

```
%---zeichen1.tex---
\[ \forall x\in\mathbf{R}: x^2\ge0\]
```

$$
\begin{aligned}
\mathbf{A}\cdot\mathbf{x} &= \mathbf{y} \\
\text{mit } \mathbf{A} &= (a_{ij}) \\
&\quad i=1,\cdots,m; j=1,\cdots,n \\
\mathbf{x} &= (x_1,\cdots,x_n) \text{ und} \\
\mathbf{y} &= (y_1,\cdots,y_m)
\end{aligned}
$$

```
%---zeichen2.tex---
\begin{eqnarray*}
\mathbf{A}\cdot\mathbf{x} & =  &
\mathbf{y} \\
\textrm{mit } \mathbf{A}&=&(a_{ij})\\
&&i=1,\cdots,m; j=1,\cdots,n\\
\mathbf{x} & = & (x_1,\cdots, x_n)
\textrm{ und}\\
\mathbf{y} & = & (y_1, \cdots, y_m)\\
\end{eqnarray*}
```

2.7 Brüche

$\frac{1}{2} \qquad \frac{n+1}{3}$

```
%---bruch1.tex---
\[ \frac{1}{2} \qquad \frac{n+1}{3} \]
```

$\frac{x+y^2}{k+1} \qquad \frac{x+y^2}{k}+1 \qquad x+\frac{y^2}{k}+1$

$x+\frac{y^2}{k+1} \qquad x+y^{\frac{2}{k+1}}$

```
%---bruch2.tex---
\[ \frac{x+y^2}{k+1} \qquad
\frac{x+y^2}{k}+1 \qquad
x+\frac{y^2}{k}+1 \]
\[ x+\frac{y^2}{k+1} \qquad
x+y^\frac{2}{k+1} \]
```

$$\frac{\frac{a}{b}}{2} \qquad \frac{a}{\frac{b}{2}}$$

```
%---bruch3.tex---
\[ \frac{\frac{a}{b}}{2} \qquad
\frac{a}{\frac{b}{2}} \]
```

$$\frac{a/b}{2} \qquad \frac{a}{b/2}$$

```
%---bruch4.tex---
\[ \frac{a/b}{2}\qquad \frac{a}{b/2} \]
```

$$a_0 + \frac{1}{a_1 + \frac{1}{a_2 + \frac{1}{a_3 + \frac{1}{a_4}}}}$$

```
%---bruch5.tex---
\[ a_0 + \frac{1}{a_1 +
\frac{1}{a_2 +
\frac{1}{a_3 +
\frac{1}{a_4}}}} \]
```

$$a_0 + \cfrac{1}{a_1 + \cfrac{1}{a_2 + \cfrac{1}{a_3 + \cfrac{1}{a_4}}}}$$

```
%---bruch6.tex---
\[ a_0+\frac{1}{\displaystyle a_1 +
\frac{\strut 1}{\displaystyle a_2 +
\frac{\strut 1}{\displaystyle a_3 +
\frac{\strut 1}{a_4}}}} \]
```

$$\frac{\displaystyle \frac{a}{b}}{\displaystyle \frac{c}{d}}$$

```
%---bruch7.tex---
\[ \displaystyle \frac{a}{b}
\above 1pt \displaystyle \frac{c}{d} \]
```

$$\frac{\displaystyle \frac{a}{b}}{\displaystyle \frac{c}{d}}$$

```
%---bruch8.tex---
\newcommand{\dfrac}[3]{{#1\above#3 #2}}
\[ \dfrac{\displaystyle \frac{a}{b}}
{\displaystyle \frac{c}{d}}{1pt} \]
```

2.8 Wurzeln

$\sqrt{2}$

```
%---wurzel1.tex---
\[ \sqrt 2 \]
```

$\sqrt{x+2}$

```
%---wurzel2.tex---
\[ \sqrt{x+2} \]
```

$\sqrt[3]{2}$

```
%---wurzel3.tex---
\[ \sqrt[3]{2} \]
```

$$\sqrt{x^3 + \sqrt{\alpha}}$$

```
%---wurzel4.tex---
\[ \sqrt{x^3 + \sqrt\alpha} \]
```

$$\sqrt[n]{x^n + y^n}$$

```
%---wurzel5.tex---
\[\sqrt[n]{x^n + y^n}\]
```

$\sqrt[n+1]{a}$

```
%---wurzel6.tex---
\[ \sqrt[n+1]{a} \]
```

$\sqrt{a}+\sqrt{b}+\sqrt{y} \qquad \sqrt{a}+\sqrt{b}+\sqrt{y}$

```
%---wurzel7.tex---
\[ \sqrt{a}+\sqrt{b}+\sqrt{y} \qquad
\sqrt{\mathstrut a} +
\sqrt{\mathstrut b} +
\sqrt{\mathstrut y} \]
```

$\sqrt[3]{h''_n(\alpha x)}$

```
%---wurzel8.tex---
\[ \sqrt[3]{h''_n(\alpha x)} \]
```

$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+x}}}}}}$

```
%---wurzel9.tex---
\[ \sqrt{1+ \sqrt{1+ \sqrt{1+ \sqrt{1
+ \sqrt{1 + \sqrt{1+x}}}}}} \]
```

2.9 Exponenten und Indizes

$x^2 \qquad x_2 \qquad x^2y^2$

```
%---exp1.tex---
\[ x^2 \qquad x_2 \qquad x ^ 2 y ^ 2 \]
```

${}_2F_3$

```
%---exp2.tex---
\[ {}_2F_3 \]
```

$x^{2_y} \qquad x^{2^y} \qquad y_{x_2} \qquad y_{x^2}$

```
%---exp3.tex---
\[x^{2_y} \qquad x^{2^y} \qquad
y_{x_2} \qquad y_{x^2}\]
```

$((x^2)^3)^4 \qquad (x^2)^3)^4$

```
%---exp4.tex---
\[ ((x^2)^3)^4 \qquad {({x^2)}^3)}^4 \]
```

$x^{y2} \qquad x^{y^2}$

```
%---exp5.tex---
\[ {x^y}^2 \qquad x^{y^2} \]
```

$x_3^2 \qquad x_3^2 \qquad x_{92}^{31415} \qquad x_{y_b^a}^{z_c^d}$

$P_2^3 \qquad P_2^3$

```
%---exp6.tex---
\[ x^2_3 \qquad x_3^2 \qquad
x^{31415}_{92}\qquad
x_{y^a_b}^{z_c^d} \]
\[ P_2^3 \qquad P{}_2^3 \]
```

2.10 Binominalkoeffizienten und ähnliche Konstrukte

$$\binom{n+1}{3}$$

```
%---binom1.tex---
\[ {n+1\choose3} \]
```

$$\begin{matrix} x \\ y+2 \end{matrix} \qquad \binom{n}{k}$$

```
%---binom2.tex---
\[ {x \atop y + 2} \qquad
{n \choose k} \]
```

$$\binom{n}{\frac{k}{2}} \qquad \binom{n}{k/2} \qquad \binom{n}{\frac{1}{2}k}$$

```
%---binom3.tex---
\[ {n \choose \frac{k}{2}} \qquad
{n \choose k/2} \qquad
{n \choose \frac{1}{2} k}\]
```

$$\frac{\binom{n}{k}}{2} \qquad \frac{1}{2}\binom{n}{k} \qquad \frac{\binom{n}{k}}{2}$$

```
%---binom4.tex---
\[ \frac{{n \choose k}}{2} \qquad
\frac{1}{2}{n \choose k} \qquad
\frac{\displaystyle{n\choose k}}{2} \]
```

$$\binom{p}{2} x^2 y^{p-2} - \frac{1}{1-x}\frac{1}{1-x^2}$$

```
%---binom5.tex---
\[ {p \choose 2} x^2 y^{p-2} -
\frac{1}{1-x} \frac{1}{1-x^2} \]
```

$$\binom{n+1}{3}$$

```
%---binom6.tex---
\newcommand{\binom}[2]{{#1 \choose #2}}
\[ \binom{n+1}{3} \]
```

$$\ueber{x}{y+2}$$

```
%---binom7.tex---
\newcommand{\ueber}[2]{{#1 \atop #2}}
\[ \ueber{x}{y+2} \]
```

2.11 Summen

$$\sum_{i=1}^{3} z_i^2$$

```
%---sum1.tex---
\[ \sum_{i=1}^3 z_i^2 \]
```

$\sum_{i=1}^{3} z_i^2$

```
%---sum2.tex---
\[ \sum\nolimits_{i=1}^3 z_i^2 \]
```

$$\sum_{i=1}^{3} z_i^2$$

```
%---sum3.tex---
$$\sum\limits_{i=1}^3 z_i^2$$
```

$$\sum_{i=1}^{p}\sum_{j=1}^{q}\sum_{k=1}^{r} a_{ij}b_{jk}c_{ki}$$

```
%---sum4.tex---
\[ \sum_{i=1}^p \sum_{j=1}^q
\sum_{k=1}^r a_{ij}b_{jk}c_{ki} \]
```

$$\sum_{\substack{1\le i\le p\\ 1\le j\le q\\ 1\le k\le r}} a_{ij}b_{jk}c_{ki}$$

```
%---sum5.tex---
\[ \sum_{{\scriptstyle 1 \le i \le p
\atop
\scriptstyle 1 \le j \le q}
\atop
\scriptstyle 1 \le k \le r}
a_{ij} b_{jk} c_{ki} \]
```

2.12 Integrale

$$\int_{-\infty}^{\infty} \frac{1}{1+x^2} dx$$

```
%---int1.tex---
\[ \int_{-\infty}^{\infty}
\frac{1}{1+x^2} dx \]
```

$$\int\limits_{-\infty}^{\infty} \frac{1}{1+x^2} dx$$

```
%---int2.tex---
\[ \int_{-\infty}^{\infty}\limits
\frac{1}{1+x^2} dx \]
```

$$\int\int_D f(x,y)dxdy$$

$$\iint_D f(x,y)\,dx\,dy$$

```
%---int3.tex---
\[ \int\int_D\limits f(x,y)dxdy \]
\[ \int\!\!\!\int_D\limits f(x,y)
\,dx\,dy \]
```

$$\int \frac{x+1}{x^2(x-1)(x^2+4)}dx$$

```
%---int4.tex---
\[ \int\frac{x+1}{x^2(x-1)(x^2+4)}dx \]
```

$$\int \sqrt{1+4x^2}dx$$

```
%---int5.tex---
\[ \int \sqrt{1+4x^2} dx \]
```

$$\frac{1}{2}\int_0^{2\pi}[a\cos t \cdot b\cos t - (-a\sin t)\cdot b\sin t]dt$$

```
%---int6.tex---
\[ \frac{1}{2} \int_0^{2\pi}\limits
[a\cos t \cdot b \cos t - (-a\sin t)
\cdot b \sin t] dt \]
```

2.13 Mathematische Funktionen

$$\lim_{x \to 0} \frac{\sin x}{x} = 1$$

```
%---funk1.tex---
\[\lim_{x \to 0} \frac{\sin x}{x} = 1\]
```

$$\int \frac{dx}{\sin ax \cos ax} = \frac{1}{a} \ln \tan ax$$

```
%---funk2.tex---
\[\int \frac{dx}{\sin a x \cos a x}
= \frac{1}{a} \ln \tan a x\]
```

$$\arcsin x = \left[\arccos \sqrt{1 - x^2}\right]$$

```
%---funk3.tex---
\[\arcsin x = \left[\arccos
\sqrt{1-x^2}\right]\]
```

2.14 Matrizen und andere rechteckige Anordnungen

$$\begin{vmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{11} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{vmatrix}$$

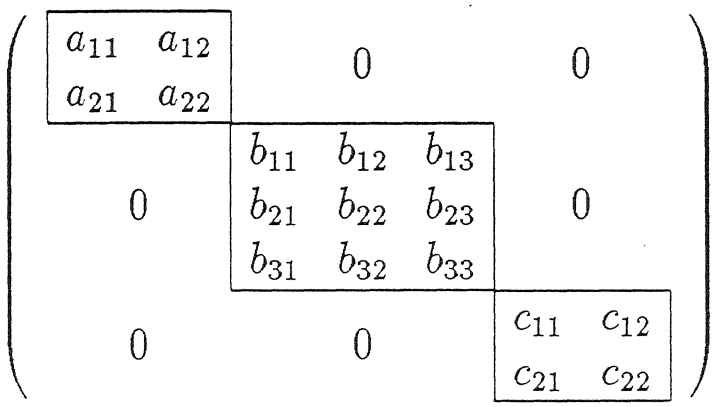
```
%---matrix1.tex
\[ \begin{array}{|cccc|}
a_{11} & a_{12} & \cdots & a_{1n} \\
a_{21} & a_{22} & \cdots & a_{11} \\
\vdots & \vdots & \ddots & \vdots \\
a_{m1} & a_{m2} & \cdots & a_{mn}
\end{array} \]
```

$$\left\{\begin{array}{cccc}
\Gamma_{11} & \Gamma_{12} & \cdots & \Gamma_{1n} \\
\Gamma_{21} & \Gamma_{22} & \cdots & \Gamma_{2n} \\
\vdots & \vdots & \ddots & \vdots \\
\Gamma_{m1} & \Gamma_{m2} & \cdots & \Gamma_{mn}
\end{array}\right\}$$

```
%---matrix2.tex---
\begin{displaymath}
\left\{\begin{array}{cccc}
\Gamma_{11}&\Gamma_{12}&\cdots&
\Gamma_{1n}\\
\Gamma_{21}&\Gamma_{22}&\cdots&
\Gamma_{2n}\\
\vdots     &\vdots     &\ddots&\vdots\\
\Gamma_{m1}&\Gamma_{m2}&\cdots&
\Gamma_{mn}
\end{array}\right\}
\end{displaymath}
```

$$|x| = \begin{cases} x & \text{für } x \geq 0 \\ -x & \text{für } x < 0 \end{cases}$$

```
%---matrix3.tex---
\[ |x|= \left\{ \begin{array}{ll}
 x & \textrm{f"ur $x \ge 0$}\\
-x & \textrm{f"ur $x <   0$}\\
\end{array}\right. \]
```



```
%---matrix4.tex---
\[\left(
\begin{array}{c@{}c@{}c}
\begin{array}{|cc|}
\hline
a_{11} & a_{12} \\
a_{21} & a_{22} \\
\hline
\end{array} & 0 & 0 \\
0 & \begin{array}{|ccc|}
    \hline
    b_{11} & b_{12} & b_{13}\\
    b_{21} & b_{22} & b_{23}\\
    b_{31} & b_{32} & b_{33}\\
    \hline
    \end{array} & 0 \\
0 & 0 & \begin{array}{|cc|}
        \hline
        c_{11} & c_{12} \\
        c_{21} & c_{22} \\
```

```
        \hline
        \end{array} \\
\end{array}
\right)\]
```

$$\left(\begin{array}{cccc}
a_{11} & a_{12} & \cdots & a_{1n} \\
a_{21} & a_{22} & \cdots & a_{2n} \\
\vdots & \vdots & \ddots & \vdots \\
a_{m1} & a_{m2} & \cdots & a_{mn}
\end{array}\right)$$

$$\left[\begin{array}{cccc}
x_{11} & x_{12} & \cdots & x_{1j} \\
x_{21} & x_{22} & \cdots & x_{2j} \\
\vdots & \vdots & \ddots & \vdots \\
x_{i1} & x_{i2} & \cdots & x_{ij}
\end{array}\right]$$

$$\left\{\begin{array}{cccc}
\int_{11} & \int_{12} & \cdots & \int_{1n} \\
\int_{21} & \int_{22} & \cdots & \int_{2n} \\
\vdots & \vdots & \ddots & \vdots \\
\int_{m1} & \int_{m2} & \cdots & \int_{mn}
\end{array}\right\}$$

```
%---matrix5.tex---
\newcommand{\A}[5]{
\left#1\begin{array}{cccc}
{#2}_{11} &{#2}_{12} &\cdots&
{#2}_{1#4}\\
{#2}_{21} &{#2}_{22} &\cdots&
{#2}_{2#4}\\
\vdots    &\vdots    &\ddots&
\vdots    \\
{#2}_{#31}&{#2}_{#32}&\cdots&
{#2}_{#3#4}
```

```
\end{array}\right#5}

\[ \A(amn) \]
\[ \A[xij] \]
\[ \A\{{\int}mn\} \]
```
