

Matice a vektory

Definice pomocí složených závorek

```
v = {1, 2, 3}
```

```
{1, 2, 3}
```

```
A = {{1, 2}, {3, 4}}
```

```
{{1, 2}, {3, 4}}
```

Definice pomocí menu "Insert->Table/Matrix"

```
w = ( 1 2 3 )
```

```
{{1, 2, 3}}
```

Definice pomocí palety

Pozn. : Ctrl + Enter - nový řádek, Ctrl +, - nový sloupec

```
B =  $\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$ 
```

```
{{1, 2, 3}, {4, 5, 6}, {7, 8, 9}}
```

Zobrazení matice

MatrixForm[], // MatrixForm - zobrazení v maticovém formátu

```
B // MatrixForm
```

```
 $\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$ 
```

Prístup k jednotlivým prvkům matice

v[[n]] nebo Part[v, n] ... vypíše n - tý člen vektoru v (číslováno od 1)

```
v[[2]]
```

```
2
```

m[[i, j]] nebo Part[m, i, j] ... vypíše prvek na i - tém řádku a j - tém sloupci matice m

```
B[[2, 2]]
```

```
5
```

```
Part[B, 1, 2]
```

```
2
```

Tr[m, list] ... výpis diagonály matice

```
Tr[B, List]
```

```
{1, 5, 9}
```

Take[m, {i0, j0}, {i1, j1}] ... submatice tvořená řádky i0 až j0 a sloupci i1 až j1

```
Take[B, {1, 2}, {1, 2}]
```

```
{{1, 2}, {4, 5}}
```

Operace s vektory

Range[n] ... vytvoří vektor 1 až N

```
Range[4]
```

```
{1, 2, 3, 4}
```

Range[m, n] ... vytvoří vektor M až N

```
Range[3, 6]
```

```
{3, 4, 5, 6}
```

Range[m, n, krok] ... vytvoří vektor M až N s daným krokem

```
Range[2, 10, 2]
```

```
{2, 4, 6, 8, 10}
```

Length[v] ... určí počet prvků vektoru v

```
Length[v]
```

```
3
```

ColumnForm[v] nebo // ColumnForm ... sloupcový vektor

```
ColumnForm[v]
```

```
1
```

```
2
```

```
3
```

Vektorové operace :

* ... násobení skalárem

. ... skalární součin

Cross ... vektorový součin

```
q = {1, 2, 3}
```

```
{1, 2, 3}
```

```
w = {1, 2, 3}
```

```
{1, 2, 3}
```

```
w * 5
```

```
{5, 10, 15}
```

```
w . q
```

```
14
```

```
Cross[w, q]
```

```
{0, 0, 0}
```

Operace s maticemi

DiagonalMatrix[{a, b, c}] ... Diagonální matice

```
DiagonalMatrix[{1, 2, 3}] // MatrixForm
```

```

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$

```

IdentityMatrix[n] ... Jednotková matice

```
IdentityMatrix[5] // MatrixForm
```

```

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

```

Dimensions[M] ... Rozměry matice

```
Dimensions[B]
```

```
{3, 3}
```

Det[M] ... Determinant matice

Det[B]

0

Transpose[M] ... Transpozice matice

Transpose[B]

 $\{\{1, 4, 7\}, \{2, 5, 8\}, \{3, 6, 9\}\}$

Tr[M] ... stopa matice (součet diagonálních prvků)

Tr[B]

15

Inverse[M] ... Inverzní matice

 $\mathbf{k} = \{\{1, -2\}, \{2, 3\}\}$ $\{\{1, -2\}, \{2, 3\}\}$

Inverse[k]

 $\left\{\left\{\frac{3}{7}, \frac{2}{7}\right\}, \left\{-\frac{2}{7}, \frac{1}{7}\right\}\right\}$

Eigenvalues[k] ... vlastní číslo matice k

http://cs.wikipedia.org/wiki/Vlastní_číslo

Eigenvalues[k]

 $\{2 + i\sqrt{3}, 2 - i\sqrt{3}\}$

Eigenvectors[k] ... vlastní vektor matice k

Eigenvectors[k]

 $\left\{\left\{-\frac{3}{2} + \frac{1}{2}(2 + i\sqrt{3}), 1\right\}, \left\{-\frac{3}{2} + \frac{1}{2}(2 - i\sqrt{3}), 1\right\}\right\}$

Další maticové operace (* ... násobení skalárem, maticový součin)

 $\mathbf{r} = \{\{1, 2\}, \{3, 4\}\}$ $\{\{1, 2\}, \{3, 4\}\}$ $\mathbf{s} = \{\{2, 2\}, \{3, 3\}\}$ $\{\{2, 2\}, \{3, 3\}\}$

```
r * 2
```

```
{{2, 4}, {6, 8}}
```

```
r . s
```

```
{{8, 8}, {18, 18}}
```

Funkce Table

Vytvoření vektoru nebo matice s možností dalšího nastavení

Table[výraz, {počet}]

```
Table[25, {5}]
```

```
{25, 25, 25, 25, 25}
```

Table[funkce, {i, max}] ... vyhodnocení funkce pro i od 1 do max

```
Table[2 i + 5, {i, 5}]
```

```
{7, 9, 11, 13, 15}
```

Table[funkce, {i, min, max}] ... vyhodnocení funkce pro i od min do max

```
Table[2 i + 5, {i, 2, 5}]
```

```
{9, 11, 13, 15}
```

Table[funkce, {i, min, max, d}] ... vyhodnocení funkce pro i od min do max s krokem d

```
Table[2 i + 5, {i, 2, 10, 2}]
```

```
{9, 13, 17, 21, 25}
```

Table[funkce, {i, min, max}, {i, min, max}] ... vyhodnocení funkce pro i a j od min do max

```
Table[i * j, {i, 5}, {j, 5}]
```

```
{{1, 2, 3, 4, 5}, {2, 4, 6, 8, 10}, {3, 6, 9, 12, 15}, {4, 8, 12, 16, 20}, {5, 10, 15, 20, 25}}
```

```
Table[i * j, {i, 1, 5}, {j, 1, 5}]
```

```
{{1, 2, 3, 4, 5}, {2, 4, 6, 8, 10}, {3, 6, 9, 12, 15}, {4, 8, 12, 16, 20}, {5, 10, 15, 20, 25}}
```

```
% // MatrixForm
```

```
(
  1  2  3  4  5
  2  4  6  8 10
  3  6  9 12 15
  4  8 12 16 20
  5 10 15 20 25
)
```

```
Table[{i + j, i * j}, {i, 1, 5}, {j, 1, 5}]
```

```
{{{2, 1}, {3, 2}, {4, 3}, {5, 4}, {6, 5}},
 {{3, 2}, {4, 4}, {5, 6}, {6, 8}, {7, 10}}, {{4, 3}, {5, 6}, {6, 9}, {7, 12}, {8, 15}},
 {{5, 4}, {6, 8}, {7, 12}, {8, 16}, {9, 20}}, {{6, 5}, {7, 10}, {8, 15}, {9, 20}, {10, 25}}}
```

TableForm[T] nebo // TableForm ... Zobrazení ve formátu tabulky

```
T = Table[i^j, {i, 1, 5}, {j, 1, 3}]
```

```
{{1, 1, 1}, {2, 4, 8}, {3, 9, 27}, {4, 16, 64}, {5, 25, 125}}
```

```
T // TableForm
```

```
1 1 1
2 4 8
3 9 27
4 16 64
5 25 125
```

```
Options[TableForm]
```

```
{TableAlignments -> Automatic, TableDepth -> ∞,
 TableDirections -> Column, TableHeadings -> None, TableSpacing -> Automatic}
```

```
TableForm[T, TableAlignments -> Center,
 TableHeadings -> {Automatic, {"x", "x^2", "x^3"}}, TableSpacing -> {2, 2}]
```

	x	x ²	x ³
1	1	1	1
2	2	4	8
3	3	9	27
4	4	16	64
5	5	25	125

```
GridBox[T] // DisplayForm
```

```
1 1 1
2 4 8
3 9 27
4 16 64
5 25 125
```

```
Options[GridBox]
```

```
{AllowScriptLevelChange -> True, AutoDelete -> True, BaselinePosition -> Automatic,
 BaseStyle -> {}, ColumnAlignments -> Center, ColumnBackgrounds -> None,
 ColumnLines -> False, ColumnsEqual -> False, ColumnSpacings -> 0.8, ColumnWidths -> All,
 DefaultBaseStyle -> Grid, DefaultFrameStyle -> {}, FrameStyle -> {}, GridBoxAlignment -> {},
 GridBoxBackground -> {}, GridBoxDividers -> {}, GridBoxFrame -> {}, GridBoxItemSize -> {},
 GridBoxItemStyle -> {}, GridBoxSpacings -> {}, GridDefaultElement -> □, GridFrame -> False,
 GridFrameMargins -> {{0.4, 0.4}, {0.5, 0.5}}, MultilineFunction -> None,
 RowAlignments -> Baseline, RowBackgrounds -> None, RowHeights -> Automatic,
 RowLines -> False, RowMinHeight -> 1., RowsEqual -> False, RowSpacings -> 1.}
```

```
GridBox[T, RowLines → True, ColumnLines → True] // DisplayForm
```

1	1	1
2	4	8
3	9	27
4	16	64
5	25	125

```
GridBox[T, RowLines → True, ColumnLines → True,
  ColumnAlignments → {Left, Center, Right}, RowAlignments → {Bottom, Center, Top},
  RowMinHeight → {2, 7, 4}, ColumnWidths → 4] // DisplayForm
```

1	1	1
2	4	8
3	9	27
4	16	64
5	25	125

```
FrameBox[%] // DisplayForm
```

1	1	1
2	4	8
3	9	27
4	16	64
5	25	125

```
GridBox[T, GridFrame → True] // DisplayForm
```

1	1	1
2	4	8
3	9	27
4	16	64
5	25	125

Vytvoření tabulky, kde se pravidelně střídají velikosti řádků

Nutnost vygenerovat vektor se střídajícími se hodnotami

```
Table[2 * Mod[i, 2] + 4 * Mod[i + 1, 2], {i, 1, Dimensions[T][[1]]}]
```

```
{2, 4, 2, 4, 2}
```

Aplikace v GridBoxu

```
GridBox[T, RowLines → True, ColumnLines → True,
  ColumnAlignments → {Left, Center, Right}, RowAlignments → {Bottom, Center, Top},
  RowMinHeight → Table[2 * Mod[i, 2] + 4 * Mod[i + 1, 2], {i, 1, Dimensions[T][[1]]}],
  ColumnWidths → 4] // DisplayForm
```

1	1	1
2	4	8
3	9	27
4	16	64
5	25	125

Stejným zp. sobem lze definovat i barvy ádk :-)

```
Table[White * Mod[i, 2] + Gray * Mod[i + 1, 2], {i, 1, Dimensions[T][[1]]}]
```

```
{GrayLevel[1], GrayLevel[0.5], GrayLevel[1], GrayLevel[0.5], GrayLevel[1]}
```

```
GridBox[T, RowLines → True, ColumnLines → True,
  ColumnAlignments → {Left, Center, Right}, RowAlignments → {Bottom, Center, Top},
  RowBackgrounds → Table[White * Mod[i, 2] + Gray * Mod[i + 1, 2],
    {i, 1, Dimensions[T][[1]]}], ColumnWidths → 4] // DisplayForm
```

1	1	1
2	4	8
3	9	27
4	16	64
5	25	125

Další možnosti vytvoření tabulky : Pomocí menu Insert, Pomocí palety Calculator -> Advanced

```
GridBox[

|   |   |   |   |
|---|---|---|---|
| x | 1 | 2 | 3 |
| y | 2 | 4 | 6 |

, RowLines → True, ColumnLines → True] // DisplayForm
```

x	1	2	3
y	2	4	6

```
GridBox[
```

"x"	GridBox[{Table[xⁱ, {i, 2, 5}], ColumnWi
GridBox[Table[{i}, {i, 5}]] // DisplayForm	GridBox[Table[i^j, {i, 5}, {j, 2, 5}], Colum

```
, GridFrame → True, RowLines → True, ColumnLines → True, RowMinHeight → 3] //
DisplayForm
```

x	x ²	x ³	x ⁴	x ⁵
1	1	1	1	1
2	4	8	16	32
3	9	27	81	243
4	16	64	256	1024
5	25	125	625	3125