

**RIEŠENIE NIEKTORÝCH VÝPOČTOVÝCH ÚLOH  
V PROSTREDÍ MS MATHEMATICS**

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**ÚLOHA**

Vypočítajme v MS Mathematics nasledovné typy úloh (príkladov);

a)  $\lim_{x \rightarrow -\infty} \frac{7x^2 + 2}{2x^2 - x - 6}$

b)  $\lim_{n \rightarrow \infty} \left( \frac{n^2 + 6}{n^2} \right)^{n^2}$

c)  $\int \ln x \, dx$

d)  $\int_0^4 x \sqrt{x^2 + 9} \, dx$

e)  $\int_{-\infty}^0 e^{3x} \, dx$

f)  $\int_{-1}^1 \frac{5}{x} \, dx$

g)  $\sum_{n=1}^{\infty} \left( \frac{1}{3} \right)^n$

h)  $\sum_{n=1}^{\infty} \frac{1}{n}$

i)  $\rho = ?, \sum_{n=0}^{\infty} \frac{5^n x^n}{(n+1)^2}$

j)  $\mathbf{A} \cdot \mathbf{B} = ?, \mathbf{A} = \begin{pmatrix} 177 & 135 & 136 \\ 129 & 84 & 113 \\ 123 & 113 & 76 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 20 \\ 25 \\ 40 \end{pmatrix}$

k)  $h(\mathbf{A}) = ?, \mathbf{A}^{-1} = ?, \mathbf{A} = \begin{pmatrix} 1 & 0 & 2 \\ 2 & 1 & -1 \\ 1 & 1 & -2 \end{pmatrix}$

l)  $|\mathbf{A}| = ?, \mathbf{A} = \begin{pmatrix} 4 & -1 & -1 \\ -1 & 2 & 0 \\ -1 & 0 & 0 \end{pmatrix}$

$$1x_1 + 1x_2 + 1x_3 = 5$$

m)  $x_1, x_2, x_3 = ?, 1x_1 + 2x_2 + 3x_3 = 8$   
 $1x_1 + 3x_2 + 5x_3 = 11$

**INŠTALÁCIA**

<https://www.microsoft.com/en-us/download/details.aspx?id=15702>

**RIEŠENIE**

(červenou farbou si vyznačené využité ovládacie prvky v danej úlohe (príklade))

a)  $\lim_{x \rightarrow \infty} \frac{7x^2 + 2}{2x^2 - x - 6}$

The screenshot shows the Microsoft Mathematics software interface. On the left is a handheld device icon displaying a calculator application with a green keypad. Several buttons on the keypad are circled in red: the 'Calculus' menu button, the 'lim' button under it, the square root button, and the division button. The main window is titled 'Worksheet' and shows the input of the limit problem:  $\lim_{x \rightarrow \infty} \left( \frac{7x^2 + 2}{2x^2 - x - 6} \right)$ . The output is shown in two formats:  $\frac{7}{2}$  and 3.5. Below the input field is a large empty text area for working space.

b)  $\lim_{n \rightarrow \infty} \left( \frac{n^2 + 6}{n^2} \right)^{n^2}$

This screenshot shows the Microsoft Mathematics software interface again. The handheld device icon on the left has its calculator application open, with the same red highlights on the 'Calculus' menu, 'lim' button, square root button, and division button. The main worksheet window now displays a more complex limit problem:  $\lim_{n \rightarrow \infty} \left( \left( \frac{n^2 + 6}{n^2} \right)^{n^2} \right)$ . The output is given as  $e^6$  and its decimal approximation as 403.428793492735. The working space below the input field is empty.

c)  $\int \ln x \, dx$

The screenshot shows the Microsoft Mathematics software interface. On the left is a virtual calculator with a green keypad. On the right is the worksheet window.

**Worksheet Window:**

- Input:**  $\int \ln(x) \, dx$
- Output:**  $x \ln(x) - x + C$
- A message at the bottom asks if the user wants to differentiate or integrate the expression.
- Buttons for "Clear" and "Enter" are visible.

d)  $\int_0^4 x \sqrt{x^2 + 9} \, dx$

The screenshot shows the Microsoft Mathematics software interface. On the left is a virtual calculator with a green keypad. On the right is the worksheet window.

**Worksheet Window:**

- Input:**  $\int_0^4 x \sqrt{x^2 + 9} \, dx$
- Output:**  $\frac{98}{3}$
- Decimal Output:** 32.66666666666667
- Buttons for "Clear" and "Enter" are visible.

e)  $\int_{-\infty}^0 e^{3x} dx$

The screenshot shows the Microsoft Mathematics software interface. On the left is a handheld device icon displaying the calculator's menu. The main window shows the "Worksheet" tab selected. In the Input field, the integral  $\int_{-\infty}^0 e^{3x} dx$  is entered. The Output field shows the result as  $\frac{1}{3}$ , and the Decimal Output field shows it as 0.33333333333333. The status bar at the top right indicates "(Degrees / Real Numbers)".

f)  $\int_{-1}^1 \frac{5}{x} dx$

The screenshot shows the Microsoft Mathematics software interface. On the left is a handheld device icon displaying the calculator's menu. The main window shows the "Worksheet" tab selected. In the Input field, the integral  $\int_{-1}^1 \frac{5}{x} dx$  is entered. The Output field shows the result as  $\int_{-1}^1 \frac{5}{x} dx$ . The status bar at the top right indicates "(Degrees / Real Numbers)".

g)  $\sum_{n=1}^{\infty} \left(\frac{1}{3}\right)^n$

The screenshot shows the Microsoft Mathematics software interface. On the left is a handheld device icon displaying the calculator's menu. The main window shows the following:

**Worksheet** tab is selected.

**Input:**  $\sum_{n=1}^{\infty} \left(\frac{1}{3}\right)^n$

**Output:**  $\frac{1}{2}$

**Decimal Output:** 0.5

The handheld device screen shows the same input and output, with red circles highlighting the infinity symbol ( $\infty$ ) and the fraction button ( $c/d$ ) on the calculator's keyboard.

h)  $\sum_{n=1}^{\infty} \frac{1}{n}$

The screenshot shows the Microsoft Mathematics software interface. On the left is a handheld device icon displaying the calculator's menu. The main window shows the following:

**Worksheet** tab is selected.

**Input:**  $\sum_{n=1}^{\infty} \frac{1}{n}$

**Output:**  $\infty$

The handheld device screen shows the same input and output, with red circles highlighting the infinity symbol ( $\infty$ ) and the fraction button ( $c/d$ ) on the calculator's keyboard.

**Poznámka 1.** Pri výpočte niektorých typov radov je potrebné upraviť hornú hranicu a hodnotu  $\infty$  modifikovať napr. na hodnotu 1000; 800; ...

i)  $\rho = ?, \sum_{n=0}^{\infty} \frac{5^n x^n}{(n+1)^2}$

The screenshot shows the Microsoft Mathematics software interface. On the left is a handheld device icon displaying a calculator menu with various buttons like Calculus, Statistics, Trigonometry, Linear Algebra, Standard, and Favorite Buttons. Two buttons in the Calculus section are circled in red: 'lim' and '∞'. On the right is the software window with tabs 'Worksheet' and 'Graphing'. The 'Worksheet' tab is selected. In the Input field, the limit expression  $\lim_{n \rightarrow \infty} \left( \frac{5^{n+1}}{(n+2)^2} \right)$  is entered. The Output field shows the result 5. Below the input field, the simplified fraction  $\rho = \frac{1}{5}$  is displayed. There are 'Clear' and 'Enter' buttons at the bottom right.

j)  $\mathbf{A} \cdot \mathbf{B} = ?, \mathbf{A} = \begin{pmatrix} 177 & 135 & 136 \\ 129 & 84 & 113 \\ 123 & 113 & 76 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 20 \\ 25 \\ 40 \end{pmatrix}$

The screenshot shows the Microsoft Mathematics software interface. On the left is a handheld device icon displaying a calculator menu with various buttons like Calculus, Statistics, Trigonometry, Linear Algebra, Standard, and Favorite Buttons. One button in the Linear Algebra section, 'insert matrix', is circled in red. On the right is the software window with tabs 'Worksheet' and 'Graphing'. The 'Worksheet' tab is selected. In the Input field, the matrix multiplication expression  $\begin{pmatrix} 177 & 135 & 136 \\ 129 & 84 & 113 \\ 123 & 113 & 76 \end{pmatrix} \begin{pmatrix} 20 \\ 25 \\ 40 \end{pmatrix}$  is entered. The Output field shows the resulting column vector  $\begin{pmatrix} 12355 \\ 9200 \\ 8325 \end{pmatrix}$ . A message below the output asks if the user wants to find transpose or size or reduce. There are 'Clear' and 'Enter' buttons at the bottom right.

k)  $h(\mathbf{A}) = ?, \mathbf{A}^{-1} = ?, \mathbf{A} = \begin{pmatrix} 1 & 0 & 2 \\ 2 & 1 & -1 \\ 1 & 1 & -2 \end{pmatrix}$

The handheld calculator screen shows the menu bar with 'Linear Algebra' selected. Under 'Linear Algebra', the 'determinant' button is highlighted and circled in red. The software interface shows the input 'reduce' followed by the matrix, resulting in the output  $h(\mathbf{A}) = 3$ . Below the input field, a message asks if the user wants to find determinant, inverse, trace, transpose, size, or reduce.

The software interface also shows the input 'inverse' followed by the same matrix, resulting in the output  $\begin{pmatrix} -1 & 2 & -2 \\ 3 & -4 & 5 \\ 1 & -1 & 1 \end{pmatrix}$ .

l)  $|\mathbf{A}| = ?, \mathbf{A} = \begin{pmatrix} 4 & -1 & -1 \\ -1 & 2 & 0 \\ -1 & 0 & 0 \end{pmatrix}$

The handheld calculator screen shows the menu bar with 'Calculus' selected. Under 'Calculus', the 'determinant' button is highlighted and circled in red. The software interface shows the input 'det' followed by the matrix, resulting in the output  $-2$ . Below the input field, two options are shown: 'Solutions steps using diagonals' and 'Solution steps using expansion by minors'.

$$1x_1 + 1x_2 + 1x_3 = 5$$

m)  $x_1, x_2, x_3 = ?, 1x_1 + 2x_2 + 3x_3 = 8$

$$1x_1 + 3x_2 + 5x_3 = 11$$

The screenshot shows the Microsoft Mathematics application interface. On the left is a handheld calculator-style input field. The main workspace is titled "Worksheet" and contains the following input and solution:

**Input:** `solve({x1 + x2 + x3 = 5, x1 + 2 x2 + 3 x3 = 8, x1 + 3 x2 + 5 x3 = 11})`

**Solution:**

$$\begin{cases} x_1 = x_3 + 2 \\ x_2 = 3 - 2 x_3 \\ x_3 \in \mathbb{R} \end{cases}$$

The "Equation Solver" button in the top menu bar is highlighted with a red circle.

**Poznámka 2.** MS Mathematics rozpozná indexáciu  $x_1$  pri zadaní premennej ako  $x1$ .

**Poznámka 3.** Kopírovanie vzorcov do prostredia MS Word (docx).

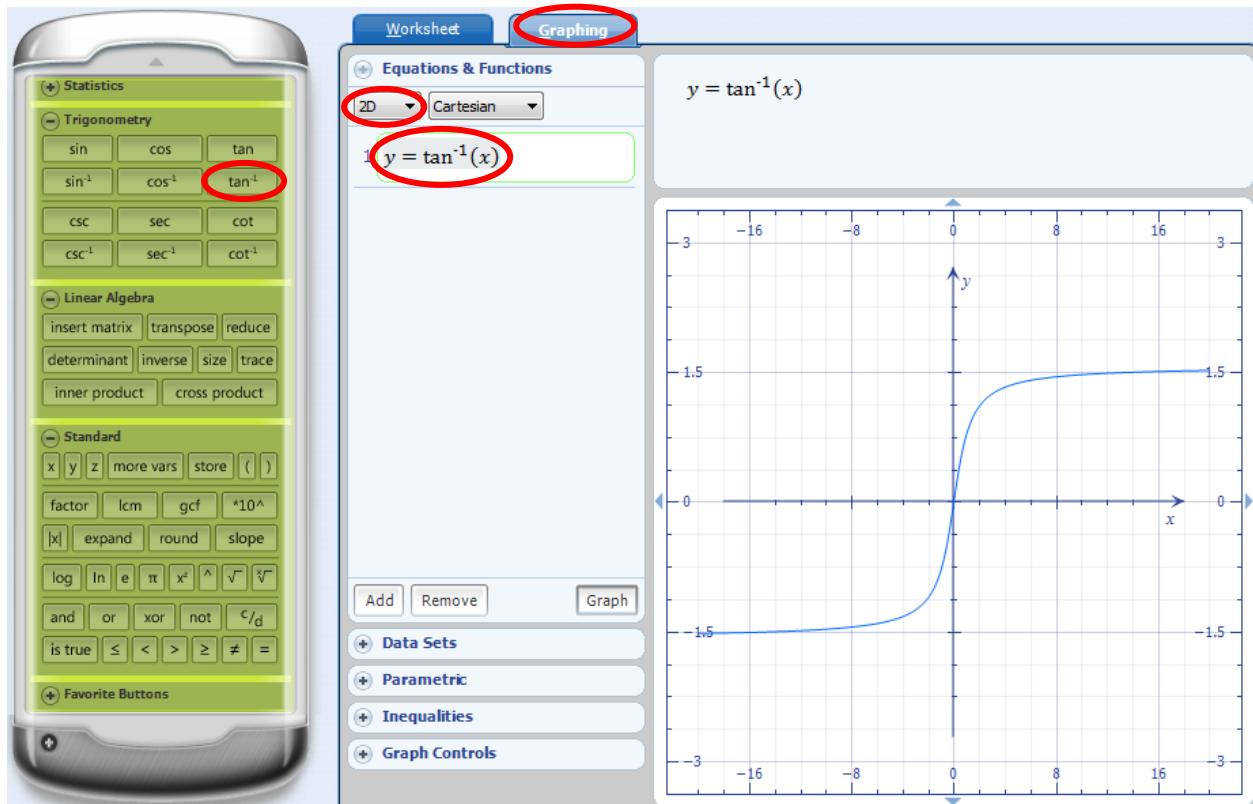
The screenshot shows the Microsoft Mathematics application interface. On the left is a handheld calculator-style input field. The main workspace is titled "Worksheet" and contains the following input and output:

**Input:**  $\int x \ln(x) dx$

**Output:**  $\frac{x^2 \ln(x)}{2} - \frac{x^2}{4}$

A context menu is open over the output expression, with several options highlighted by red circles:

- Copy
- Copy to Input
- Copy Special
- Show Keyboard Equivalents
- Keyboard Equivalents
- MathML
- Bitmap

**Poznámka 4. Príklad práce s 2D grafmi,  $y = \arctg x$** **Poznámka 5. Príklad práce s 3D grafmi,  $z = x^2 + y^2$** 