Računamo z Mathematico

Osnovno poenostavljanje izrazov

```
2 + 2
```

```
16 / 60
```

```
2^200
```

```
Sqrt[2]
```

```
N[Sqrt[2], 1000]
```

```
N[Pi, 1000]
```

```
FactorInteger[2 048 023 480 293 482 309 400]
```

```
x + x + y + x + y + x
```

```
x^2 - y^2
```

```
Factor[x^2 - y^2]
```

```
Expand[(x - y)^2 (x + y^2)^4]
```

```
Factor[2 x^4 + 7 x^2 y - 4 x^3 y - 14 x y^2 + 2 x^2 y^2 + 7 y^3 - x^2 z + 2 x y z - y^2 z + 6 x^4 z^2 +
  21 x^2 y z^2 - 12 x^3 y z^2 - 42 x y^2 z^2 + 6 x^2 y^2 z^2 + 21 y^3 z^2 - 3 x^2 z^3 + 6 x y z^3 - 3 y^2 z^3 +
  6 x^4 z^4 + 21 x^2 y z^4 - 12 x^3 y z^4 - 42 x y^2 z^4 + 6 x^2 y^2 z^4 + 21 y^3 z^4 - 3 x^2 z^5 + 6 x y z^5 - 3 y^2 z^5 +
  2 x^4 z^6 + 7 x^2 y z^6 - 4 x^3 y z^6 - 14 x y^2 z^6 + 2 x^2 y^2 z^6 + 7 y^3 z^6 - x^2 z^7 + 2 x y z^7 - y^2 z^7]
```

```
Simplify[1/x^2 + 2/x + 1]
```

```
1/x^2 + 2/x + 1 // Simplify
```

```
Simplify[Sqrt[x^2]]
```

```
FullSimplify[Sqrt[x^2]]
```

```
FullSimplify[Sqrt[x^2], Assumptions -> {x > 0}]
```

Defincije spremenljivk in funkcij

```
a = 5
```

```
f[x_] := x^2 + 13 x - 2
```

```
f[3]
```

```
3 // f
```

```
g[x_, y_] := Sin[Sqrt[x^2 + 3 y^2]]
```

```
ClearAll[a, f]
```

```
a
```

```
f[3]
```

Linearna algebra

```
a = {{1, 2, 4}, {1, 3, 9}, {1, 4, 16}}
```

```
v = {1, 0, 2}
```

```
a.v
```

```
a // MatrixForm
```

```
Transpose[a] // MatrixForm
```

```
Inverse[a] // MatrixForm
```

```
Det[a]
```

```
Eigenvalues[a]
```

```
Eigenvalues[a] // N
```

$$b = \begin{pmatrix} \text{Cos}[t] & -\text{Sin}[t] & 0 \\ \text{Sin}[t] & \text{Cos}[t] & 0 \\ 0 & 0 & y \end{pmatrix}$$

```
a.b // MatrixForm
```

```
Eigenvalues[b]
```

```
Eigenvectors[b]
```

Risanje grafov

```
Plot[Sin[x], {x, -5, 5}]
```

```
Plot[{Sin[x], -Sin[x], Sin[x] * Cos[16 x]}, {x, -5, 5},
 PlotStyle → {RGBColor[1, 0, 0], RGBColor[0, 1, 0], RGBColor[0.5, 0.5, 0.5]},
 AspectRatio → Automatic]
```

```
Table[x^k, {k, 0, 10}]
```

```
Plot[Table[x^k, {k, 0, 10}], {x, 0, 1}]
```

```
Plot[Evaluate[Table[x^k, {k, 0, 10}]], {x, 0, 1}, PlotRange → All]
```

```
f[x_, y_] := Sin[x^2 + 2 (y - x)^2] + Cos[3 x + 4 y]
```

```
Plot3D[f[x, y], {x, -2, 2}, {y, -2, 2}]
```

```
Plot3D[f[x, y], {x, -2, 2}, {y, -2, 2}, PlotPoints → 100]
```

```
Plot3D[f[x, y], {x, -2, 2}, {y, -2, 2}, PlotPoints → 100, Mesh → False]
```

```
DensityPlot[f[x, y], {x, -2, 2}, {y, -2, 2}, PlotPoints → 60]
```

```
ContourPlot[f[x, y], {x, -2, 2}, {y, -2, 2}, PlotPoints → 60]
```

```
Needs["VectorFieldPlots` "]
```

```
GradientFieldPlot[f[x, y], {x, -1, 1}, {y, -1, 1}]

HamiltonianFieldPlot[f[x, y], {x, -1, 1}, {y, -1, 1}]

VectorFieldPlots`VectorFieldPlot[{Cos[x], Sin[y]}, {x, -2, 2}, {y, -2, 2}]

pic = Plot3D[f[x, y], {x, -2, 2}, {y, -2, 2}, PlotPoints → 100, Mesh → False]

Export["pic.eps", pic]

Export["pic.gif", pic]
```

Limite

```
Limit[x * Log[x], x → 0]
```

$$\text{Limit}\left[\sqrt{x^2 - 3x + 1} - \sqrt{x^2 + 7x + 15}\,,\ x \to \infty\right]$$

Vsote

$$\text{Sum}\left[2^k,\ \{k,\ 0,\ n\}\right]$$

$$\text{Sum}\left[k^2,\ \{k,\ 0,\ n\}\right] \text{ // FullSimplify}$$

$$\text{Sum}\left[\frac{1}{k^2},\ \{k,\ 1,\ \infty\}\right]$$

$$\text{Sum}\left[\frac{a - k}{k^3},\ \{k,\ 1,\ \infty\}\right]$$

Odvodi in integrali

```
D[Sin[x], x]
```

$$D\left[\text{Sin}\left[\text{Exp}\left[2x^3 + 7\right] / \text{Log}[x]\right], x\right]$$

```
D[f[x, y], y]

Integrate[Sin[x], x]
```

$$\text{Integrate}\left[\frac{1}{1 + x^4},\ x\right]$$

$$\text{Integrate}\left[\frac{1}{1 + x^4},\ \{x,\ 0,\ 1\}\right]$$

$$\text{Integrate}\left[\frac{\text{Sin}[x]}{x},\ \{x,\ 0,\ \infty\}\right]$$

$$\text{Integrate}\left[\frac{\text{Sin}[x]}{x},\ \{x,\ 1,\ 2\}\right]$$

$$\text{NIntegrate}\left[\frac{\text{Sin}[x]}{x},\ \{x,\ 1,\ 2\}\right]$$

$$\text{NIntegrate}\left[\frac{\text{Sin}[x]}{x},\ \{x,\ 1,\ 2\},\ \text{WorkingPrecision} \to 30\right]$$

Enačbe

```
Solve[x^2 + x + 1 == 0, x]
```

```
Solve[a x^2 + b x + c == 0, x]
```

```
Solve[x^5 + 2 x == 1, x]
```

```
NSolve[x^5 + 2 x == 1, x]
```

```
Solve[{x^2 + y^2 == a, x^2 - y^2 == b}, {x, y}]
```

```
(h = Table[1 / (i + j), {i, 1, 10}, {j, 1, 10}]) // MatrixForm
```

```
w = LinearSolve[h, Table[1, {k, 1, 10}]]
```

```
h.w
```

Diferencialne enačbe

```
DSolve[{x''[t] + x[t] == 0, x[0] == 0, x'[0] == 1}, x[t], t]
```

```
DSolve[{x'[t] == Sin[t] + x[t]}, x[t], t]
```

```
DSolve[{x''[t] + 2 x[t] == 0, x[0] == 0, x'[0] == 1}, x, t]
```

```
solution = First@NDSolve[{x''[t] + 2 x[t] == 0, x[0] == 0, x'[0] == 1}, x, {t, 0, 3}]
```

```
Plot[x[t] /. solution, {t, 0, 3}]
```

Potenčne vrste in aproksimacije

```
Series[Sin[x], {x, 0, 10}]
```

```
s = Series[m / (x - y)^2, {x, 0, 5}]
```

```
Normal[s]
```

```
Series[m / (x - y)^2, {x, ∞, 5}]
```

$$\frac{\text{Series}\left[\text{Sin}\left[x^2\right], \{x, 0, 6\}\right]}{\text{Series}\left[\frac{1}{x^2}, \{x, 0, 6\}\right]}$$