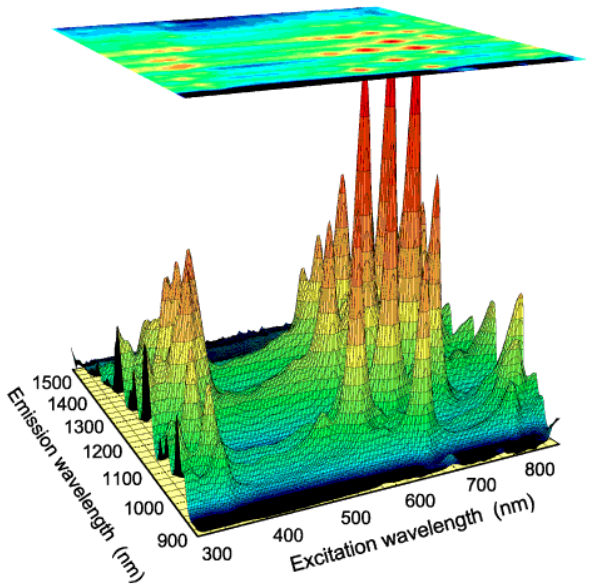


Rozwiązanie układu równań

Given

$$I_1 = I_5 + I_6$$

$$I_2 = I_4 + I_5$$

$$I_3 = I_4 - I_6$$

$$R_2 \cdot I_4 + (R_1 + R_2 + R_5) \cdot I_5 + R_1 \cdot I_6 = E_1 + E_2 - E_5$$

$$(R_2 + R_3 + R_4) \cdot I_4 + R_2 \cdot I_5 - R_3 \cdot I_6 = E_2 + E_3 + E_4$$

$$R_4 \cdot I_4 - R_5 \cdot I_5 + (R_6 + R_7) \cdot I_6 = E_4 + E_5 + E_6$$

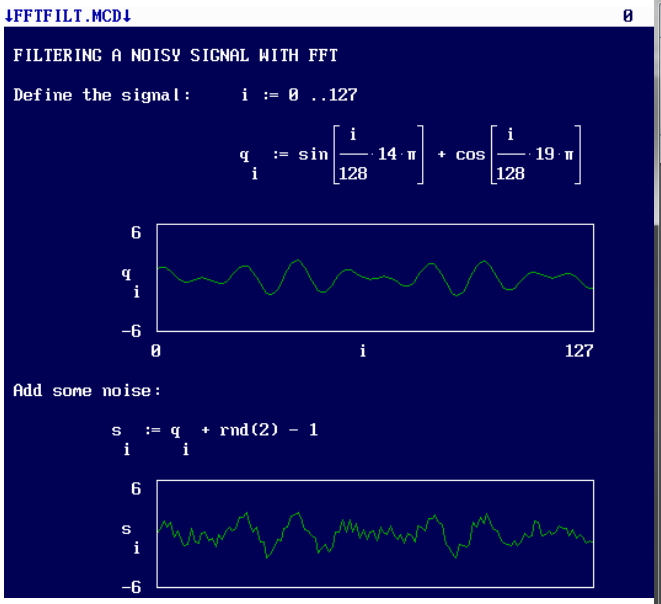
$$\text{Find}(I_1, I_2, I_3, I_4, I_5, I_6) \rightarrow \begin{pmatrix} \frac{3 \cdot V}{\Omega} \\ \frac{5 \cdot V}{\Omega} \\ \frac{2 \cdot V}{\Omega} \\ \frac{4 \cdot V}{\Omega} \\ \frac{V}{\Omega} \end{pmatrix}$$

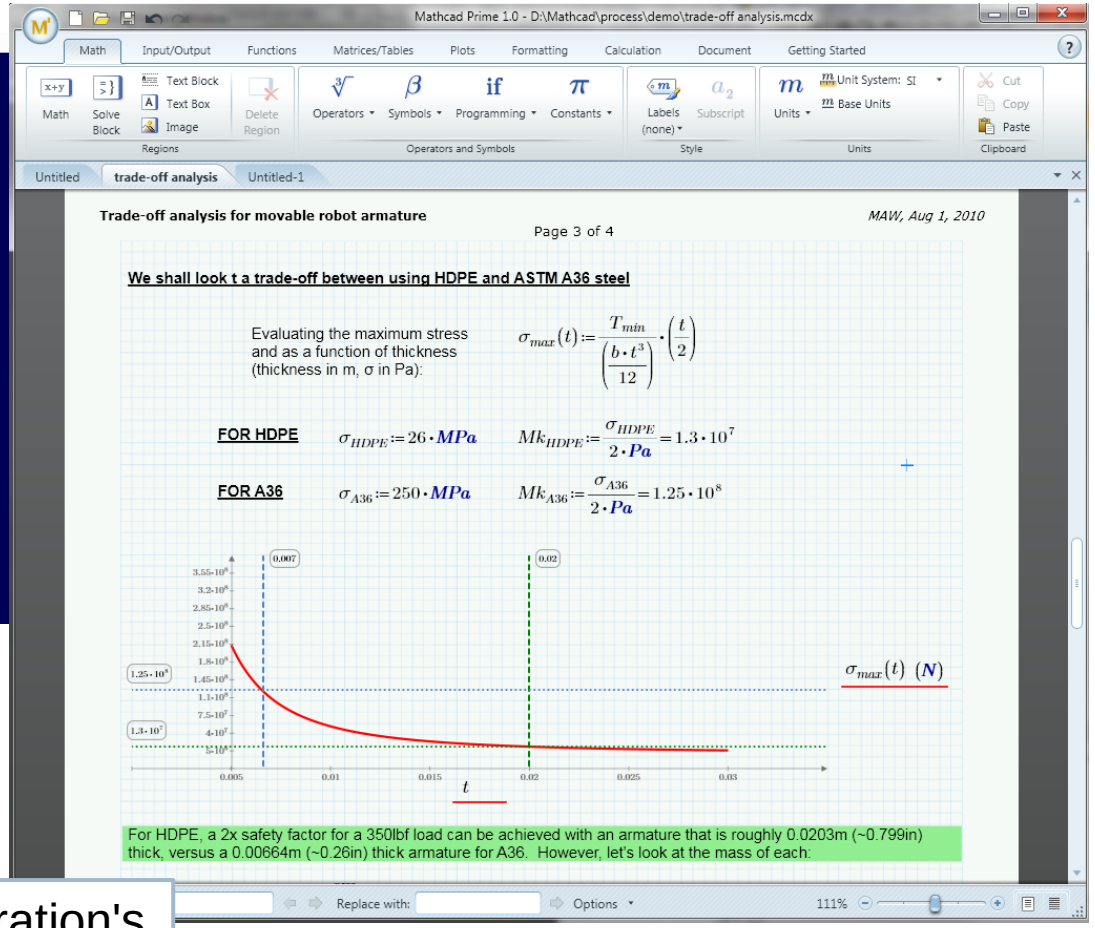
Obliczenia inżynierskie

oprogramowanie matematyczne

Mathcad – środowisko pracy

- Mathcad 15.0, Mathcad Prime 1.0



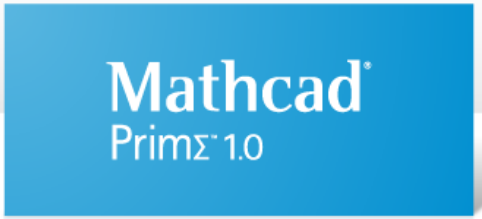


Parametric Technology Corporation's

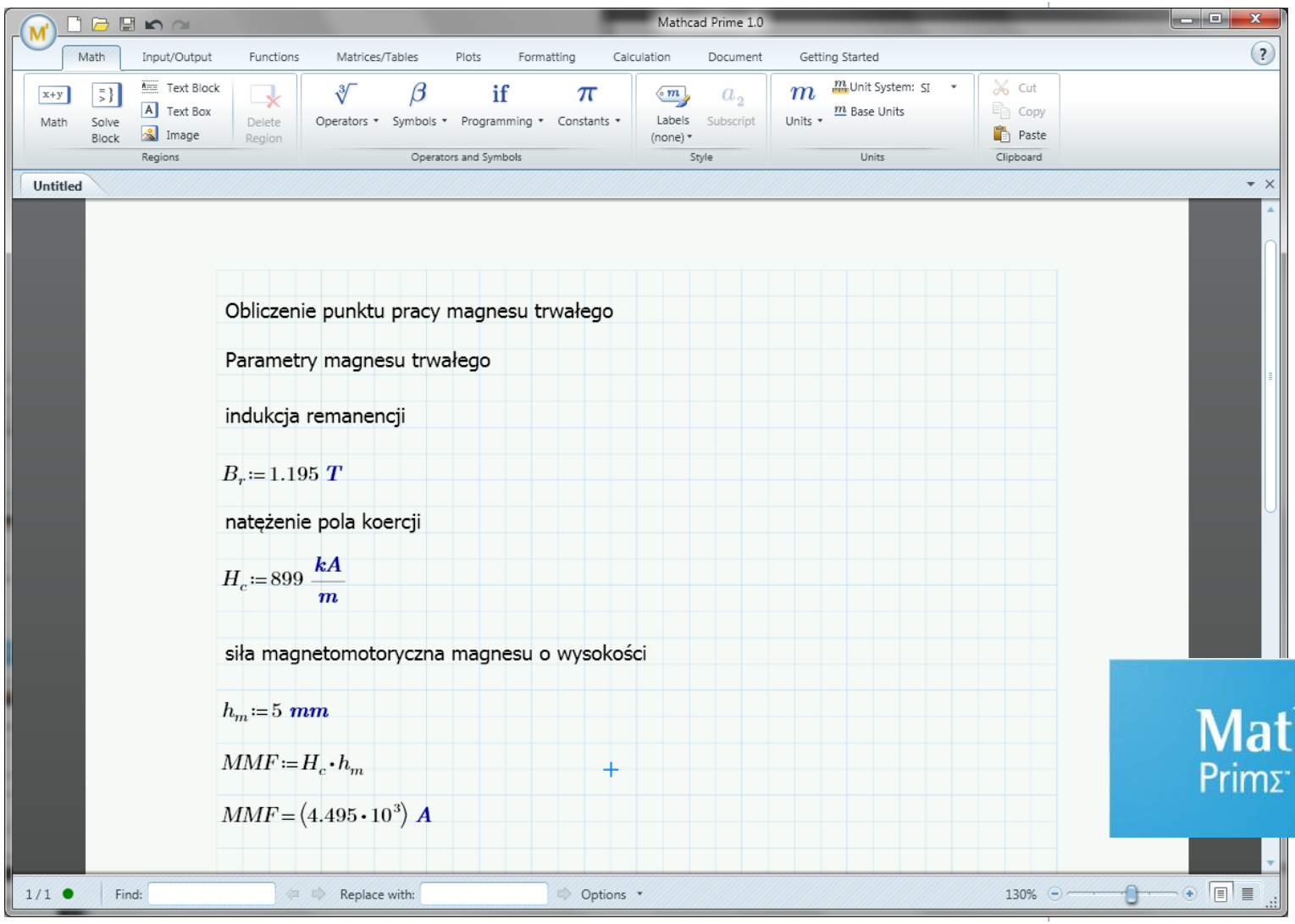
PTC Mathcad Prime 1.0

- Środowisko obliczeń *Document-centric*
- Zaawansowane odkrywanie matematyki
- Biblioteki numeryczne
- Dynamiczna kontrola jednostek
- Reverse compatibility
- Edytor równań WYSIWYG
- Design of Experiments (DoE)

PTC®



Mathcad Prime 1.0



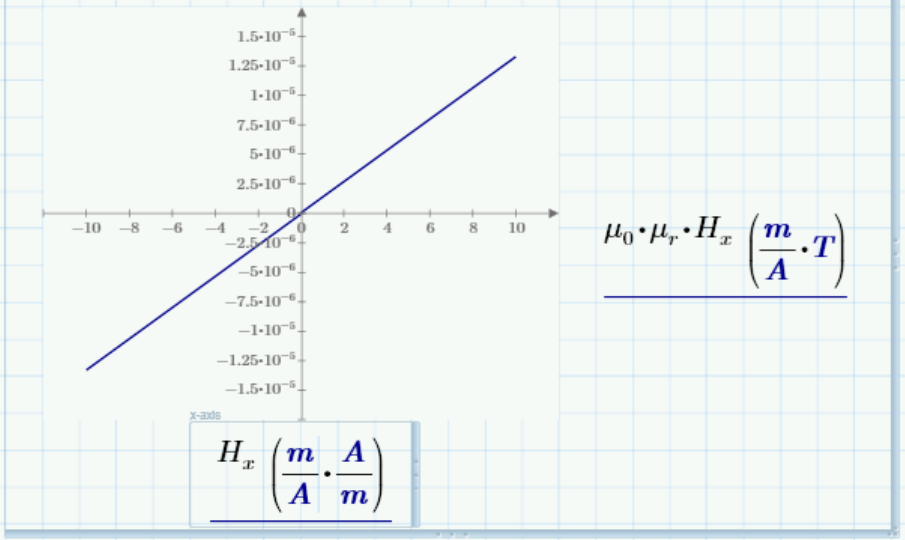
Charakterystyka odmagnesowania MT

$$B_x := B_r + \mu_0$$

These units are not compatible.

Charakterystyka odmagnesowania MT

$$B_x(H_x) := B_r + \mu_0 \cdot \mu_r \cdot H_x$$



$$\mu_0 \cdot \mu_r \cdot H_x \quad \left(\frac{m}{A} \cdot T\right)$$

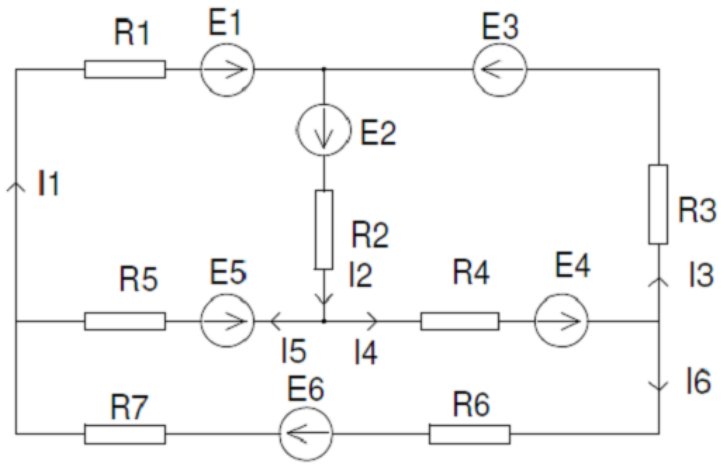
$$H_x \quad \left(\frac{m}{A} \cdot \frac{A}{m}\right)$$

Mathcad Prime 1.0

Mathcad 14/15

Rozwiązanie równań liniowych

Obliczenie obwodu elektrycznego prądu stałego



Rys. 1. Schemat obwodu elektrycznego prądu stałego.

Równania oczkowe

$$-I1 \cdot R1 + E1 + E2 - I2 \cdot R2 - E5 + I5 \cdot R5 = 0$$

$$-E3 + I3 \cdot R3 - E4 + I4 \cdot R4 + I2 \cdot R2 - E2 = 0$$

$$I5 \cdot R5 + E5 - I4 \cdot R4 + E4 - I6 \cdot R6 + E6 - R7 \cdot I6 = 0$$

Równania Kirhoff'a

$$I1 = I5 + I6$$

$$I2 = I4 + I5$$

$$I3 = I4 - I6$$

Dane

$E_1 := 45V$ $E_4 := 34V$ $R_1 := 5\Omega$ $R_4 := 6\Omega$ $R_7 := 5\Omega$

$E_2 := 10V$ $E_5 := 5V$ $R_2 := 6\Omega$ $R_5 := 5\Omega$

$E_3 := 26V$ $E_6 := 20V$ $R_3 := 8\Omega$ $R_6 := 15\Omega$

Rozwiązanie układu równań

Given

$I_1 = I_5 + I_6$

$I_2 = I_4 + I_5$

$I_3 = I_4 - I_6$

$R_2 \cdot I_4 + (R_1 + R_2 + R_5) \cdot I_5 + R_1 \cdot I_6 = E_1 + E_2 - E_5$

$(R_2 + R_3 + R_4) \cdot I_4 + R_2 \cdot I_5 - R_3 \cdot I_6 = E_2 + E_3 + E_4$

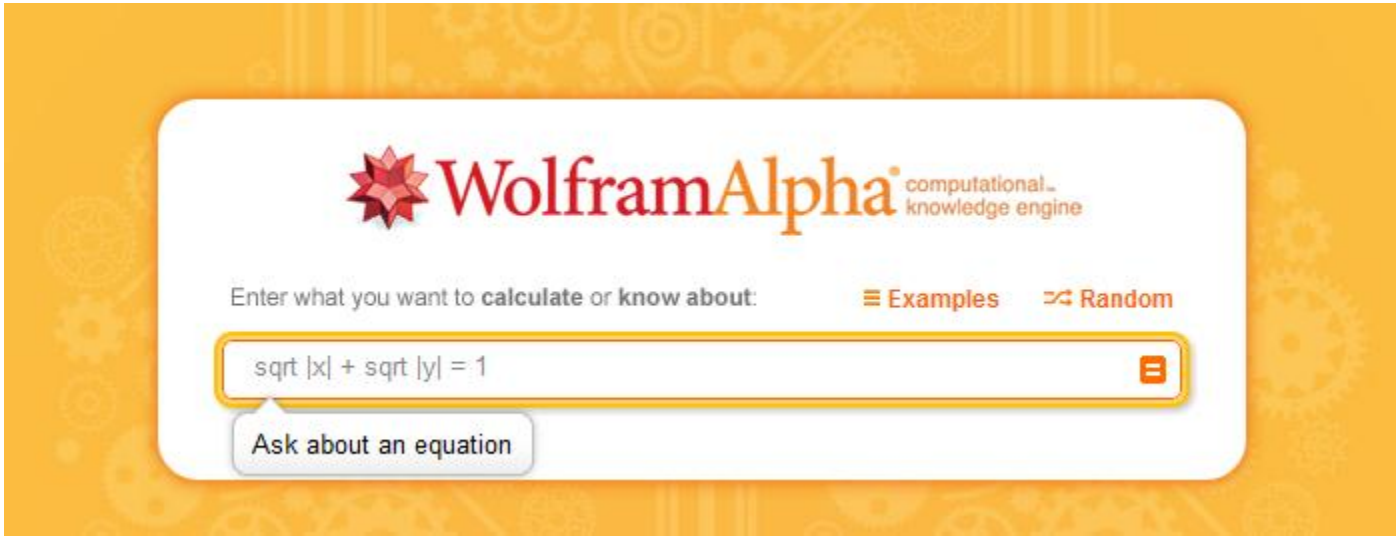
$R_4 \cdot I_4 - R_5 \cdot I_5 + (R_6 + R_7) \cdot I_6 = E_4 + E_5 + E_6$

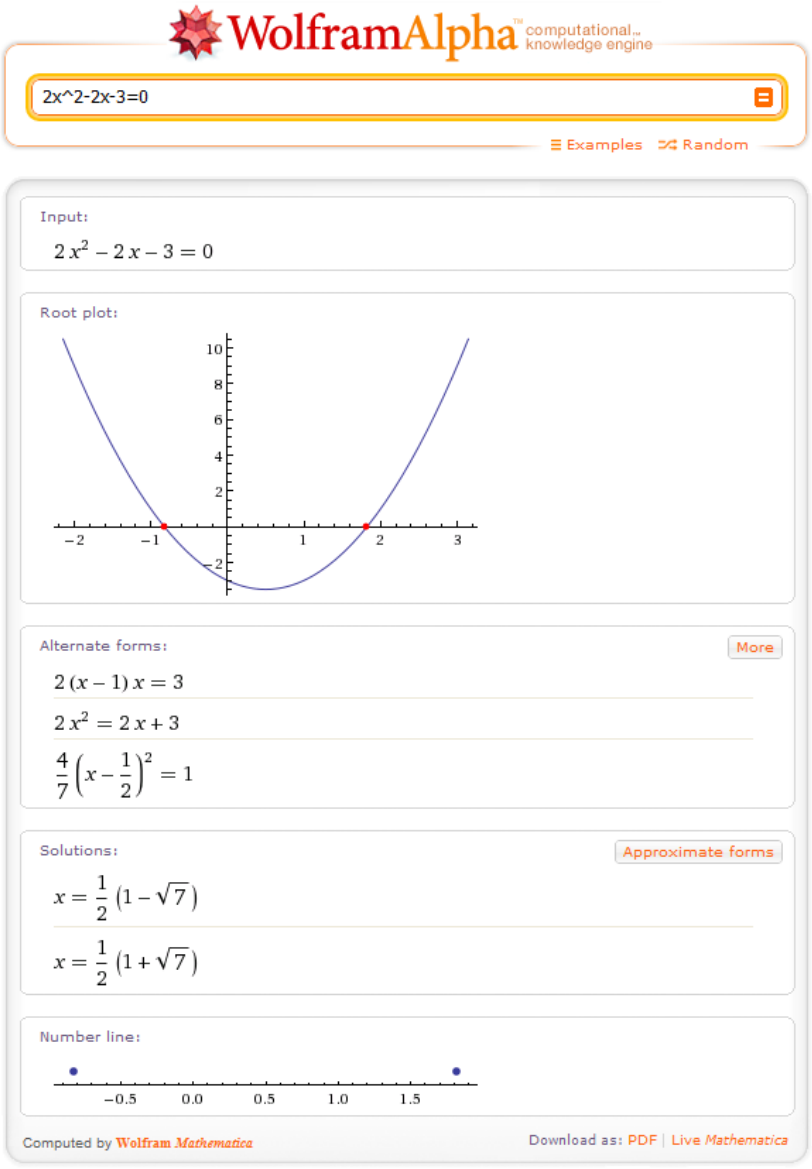
$$\text{Find}(I_1, I_2, I_3, I_4, I_5, I_6) \rightarrow \begin{pmatrix} \frac{3 \cdot V}{\Omega} \\ \frac{5 \cdot V}{\Omega} \\ \frac{2 \cdot V}{\Omega} \\ \frac{4 \cdot V}{\Omega} \\ \frac{V}{\Omega} \\ \frac{2 \cdot V}{\Omega} \end{pmatrix}$$

Mathcad 14/15

Rozwiązanie równań liniowych

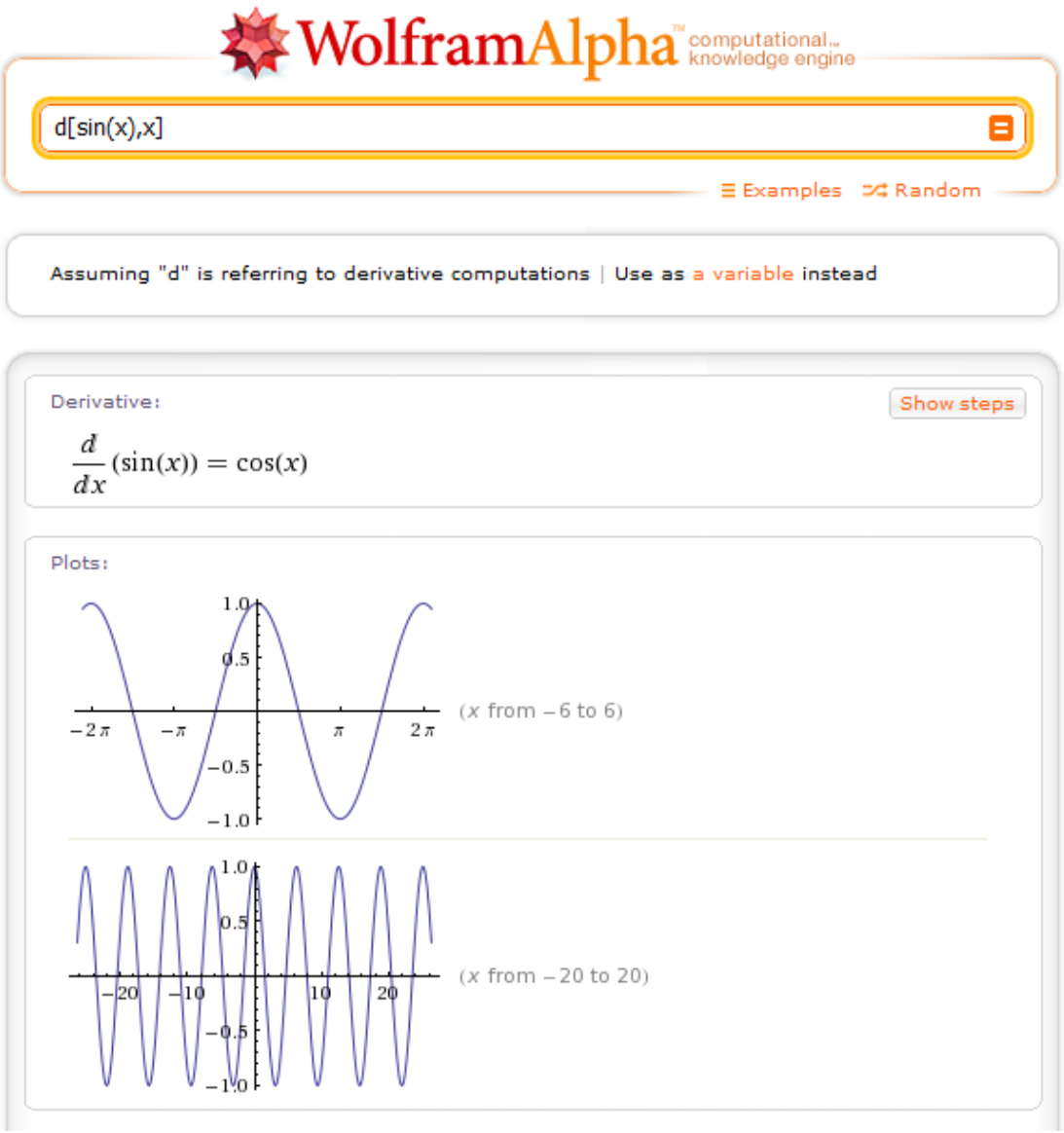
Obliczenia symboliczne - WolframAlpha





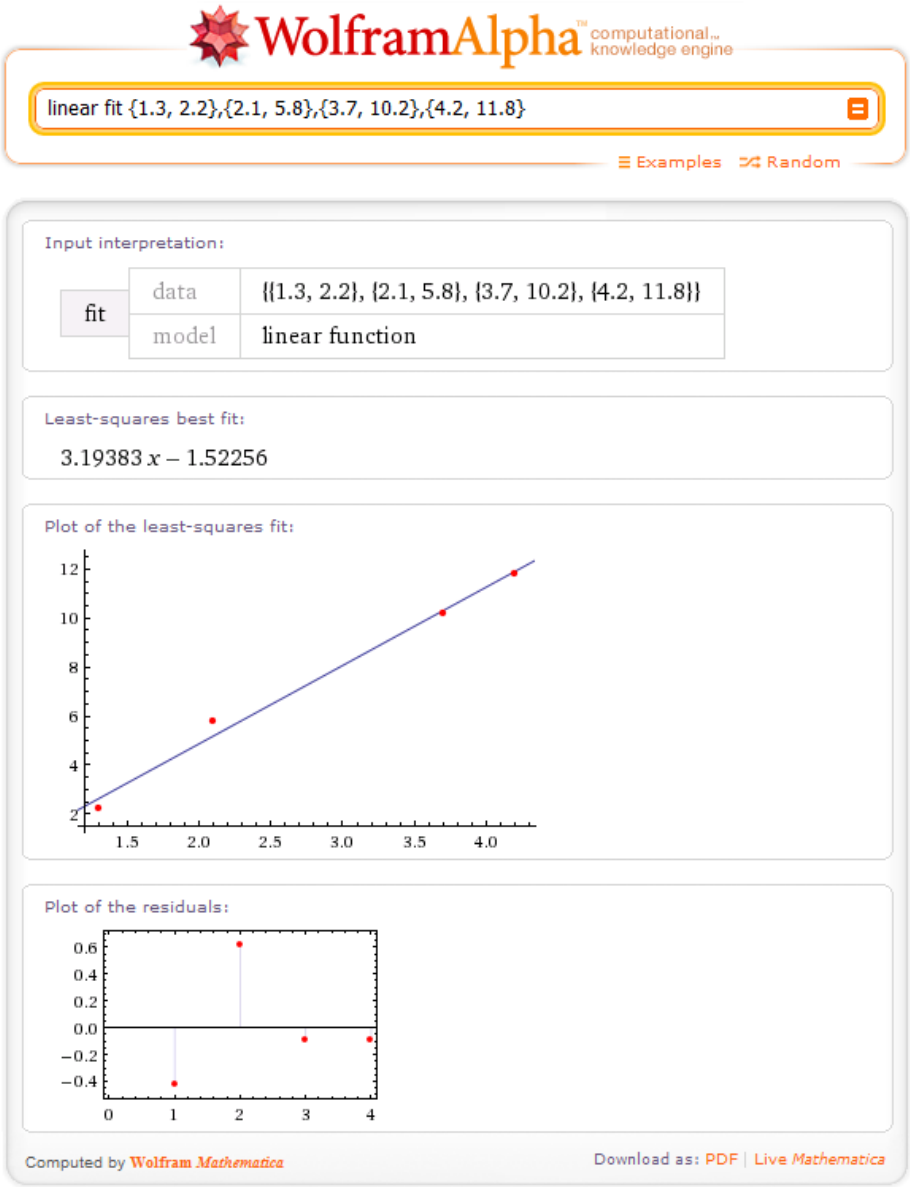
WolframAlpha

Rozwiązywanie równań liniowych



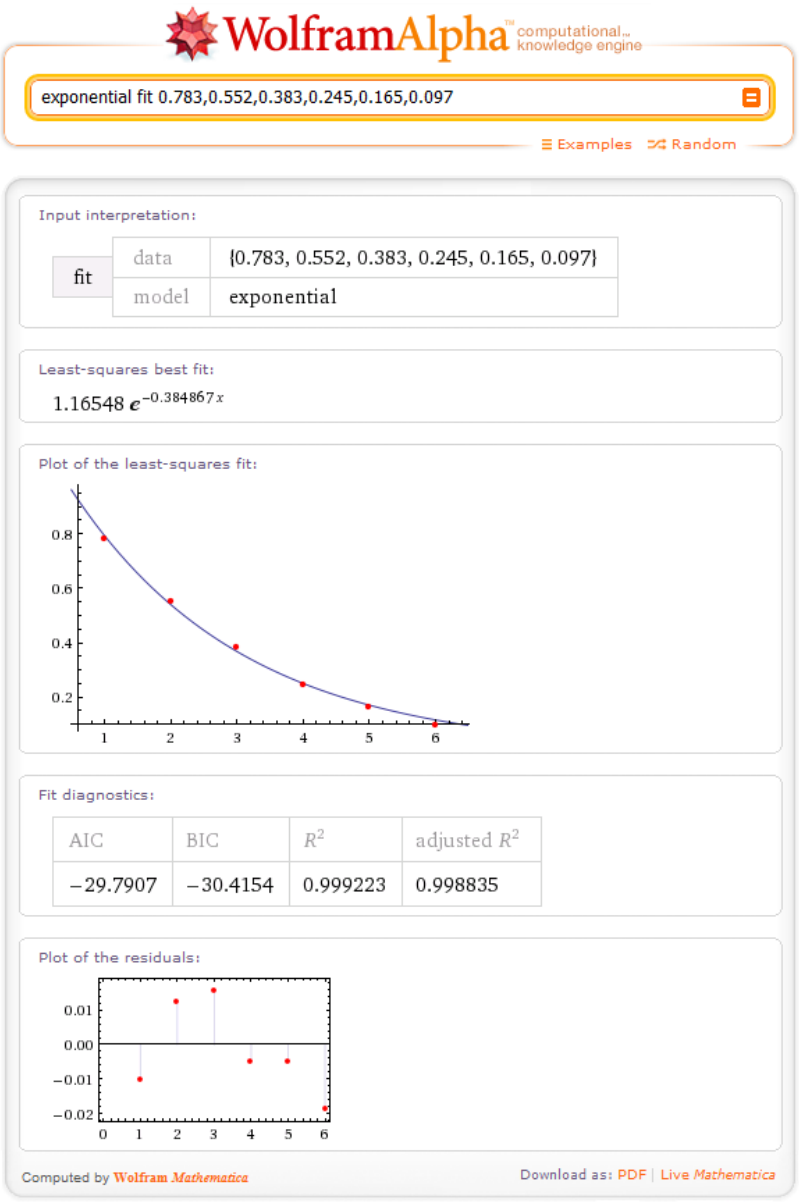
WolframAlpha

Rozwiązywanie równań różniczkowych



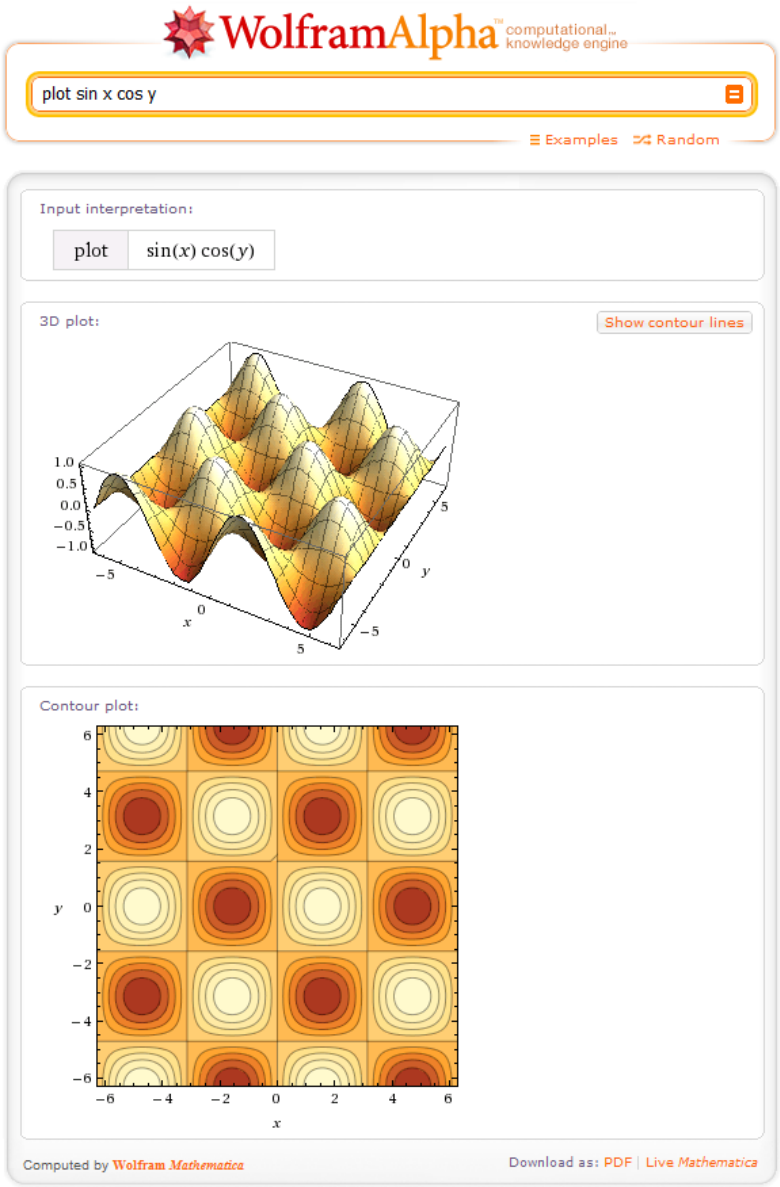
WolframAlpha

Regresja liniowa



WolframAlpha

Regresja ekspotencjalna



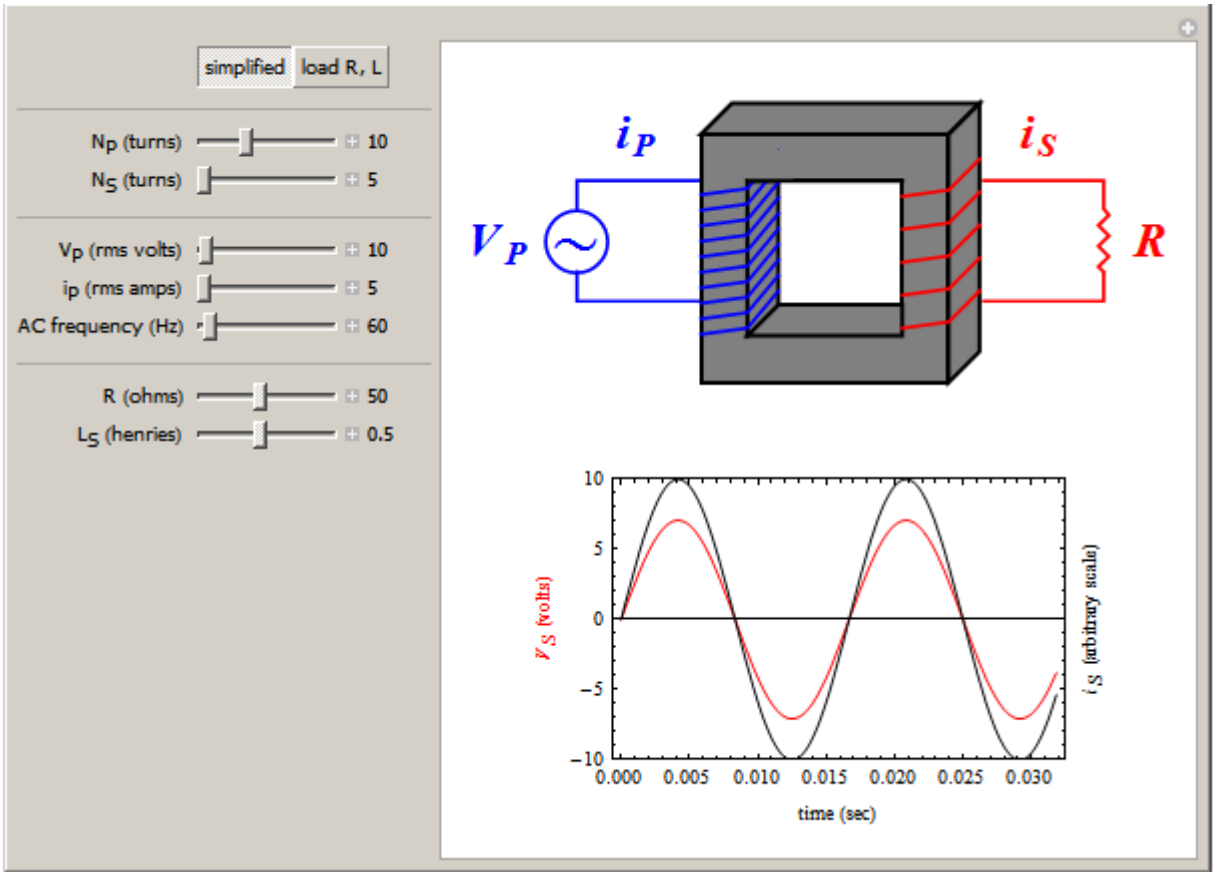
WolframAlpha

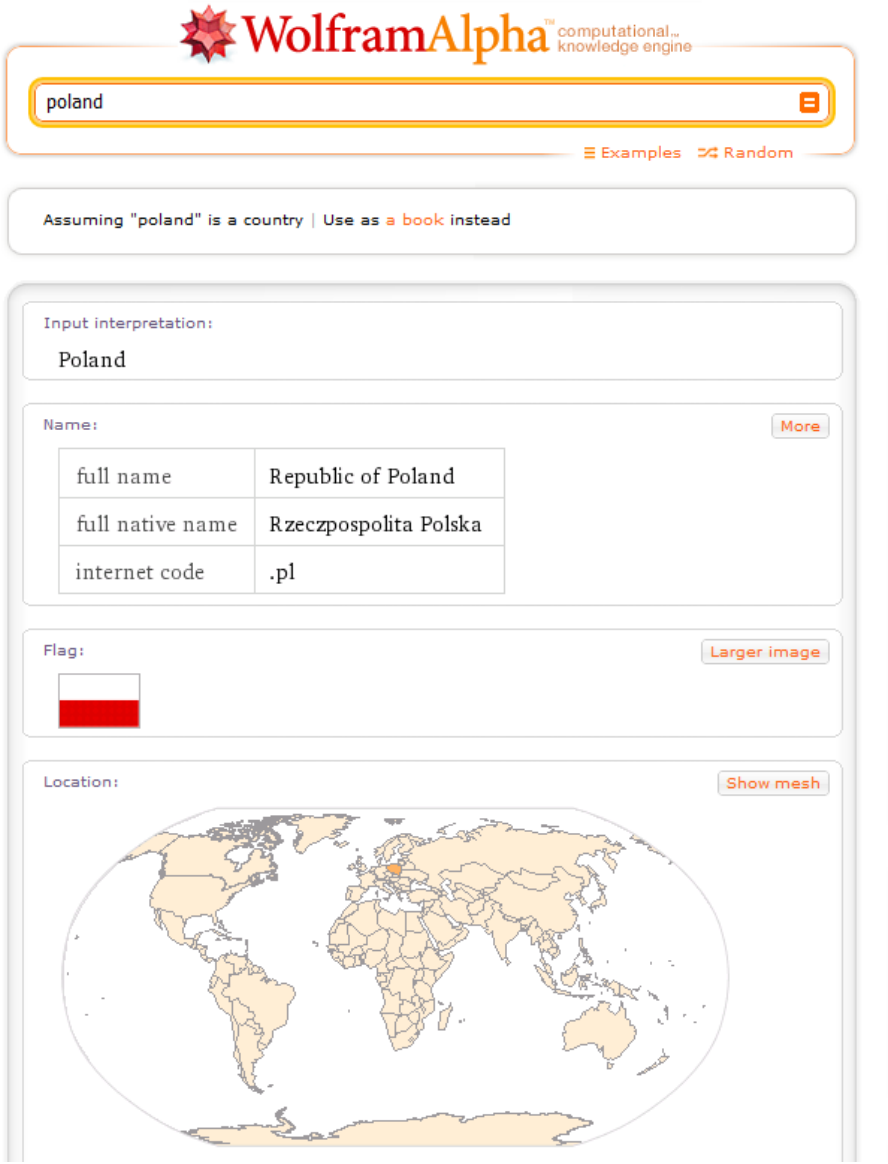
Wykresy funkcji 2D 3D

Wolfram Mathematica

```
Manipulate[
 Column[{
   transformer[np, ns],
   secondary[s, np, ns, vp, ip, f, r, ls]
  }
 ],
 {{s, 0, ""}, {0 → "simplified", 1 → "load R, L"}, ControlType → Setter},
 Delimiter,
 {{np, 10, Style[Row[{Subscript["N", "P"], " (turns)"}]]}, 5, 20, 1, Appearance → "Labeled",
  ImageSize → Tiny},
 {{ns, 5, Style[Row[{Subscript["N", "S"], " (turns)"}]]}, 5, 20, 1, Appearance → "Labeled",
  ImageSize → Tiny}, Delimiter,
 {{vp, 10, Style[Row[{Subscript["V", "P"], " (rms volts)"}]]}, 5, 250, .1,
  Appearance → "Labeled", ImageSize → Tiny},
 {{ip, 5, Style[Row[{Subscript["i", "P"], " (rms amps)"}]]}, 5, 100, .1,
  Appearance → "Labeled", ImageSize → Tiny},
 {{f, 60, "AC frequency (Hz)"}, 10, 1000, 1, Appearance → "Labeled", ImageSize → Tiny},
 Delimiter,
 {{r, 50, "R (ohms)"}, 10, 100, .1, Enabled → s == 1, Appearance → "Labeled", ImageSize → Tiny},
 {{ls, .5, Style[Row[{Subscript["L", "S"], " (henries)"}]]}, .1, 1, .1, Enabled → s == 1,
  Appearance → "Labeled", ImageSize → Tiny},
 TrackedSymbols :> {s, np, ns, vp, ip, f, r, ls}, SaveDefinitions → True,
 AutorunSequencing → {1, 2, 3, 4}]
```

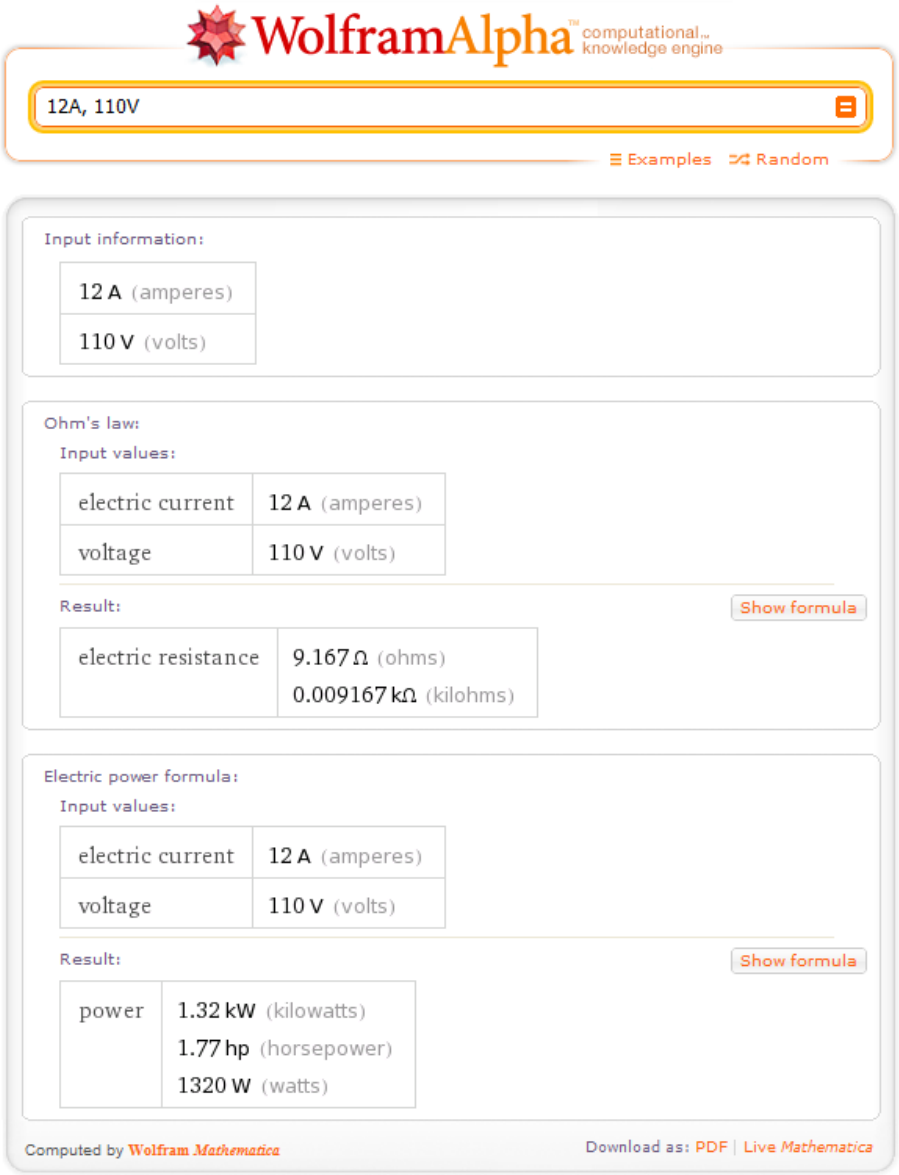
Wolfram Mathematica





WolframAlpha

Informacje geograficzne



WolframAlpha

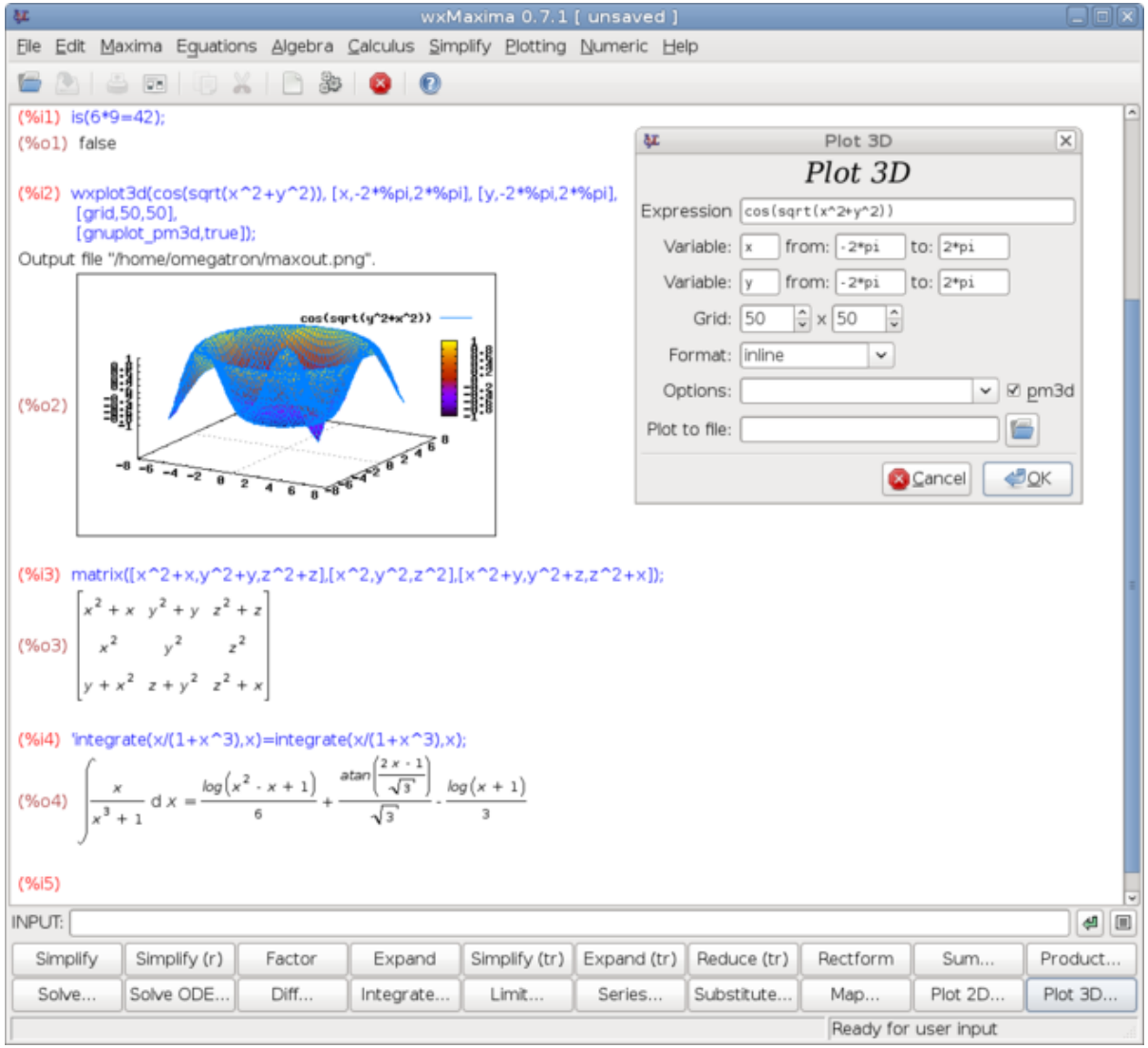
Obwody elektryczne prądu stałego

WolframAlpha

Mathematics
Statistics & Data Analysis
Physics
Chemistry
Materials
Engineering
Astronomy
Earth Sciences
Life Sciences
Computational Sciences
Units & Measures
Dates & Times
Weather
Places & Geography
People & History
Culture & Media
Music
Words & Linguistics
Sports & Games
Colors
Money & Finance
Socioeconomic Data
Health & Medicine
Food & Nutrition
Education
Organizations
Transportation
Technological World
Web & Computer Systems

Maxima

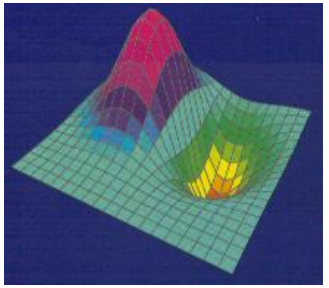
- Różniczkowanie i całkowanie symboliczne
- Rozwiązywanie równań i układów równań algebraicznych
- Rozwiązywanie wybranych typów równań różniczkowych
- Upraszczanie wyrażeń algebraicznych
- Tworzenie wykresów 2D i 3D (za pośrednictwem Gnuplota)
- Szeregi Fouriera
- Operacje na macierzach
- Obliczenia dowolnej precyzji
- Eksport wyników do TeX'a
- Strukturalny język programowania (+Lisp)
- Wybrane operacje numeryczne
- Wybrane operacje statystyczne



Maxima

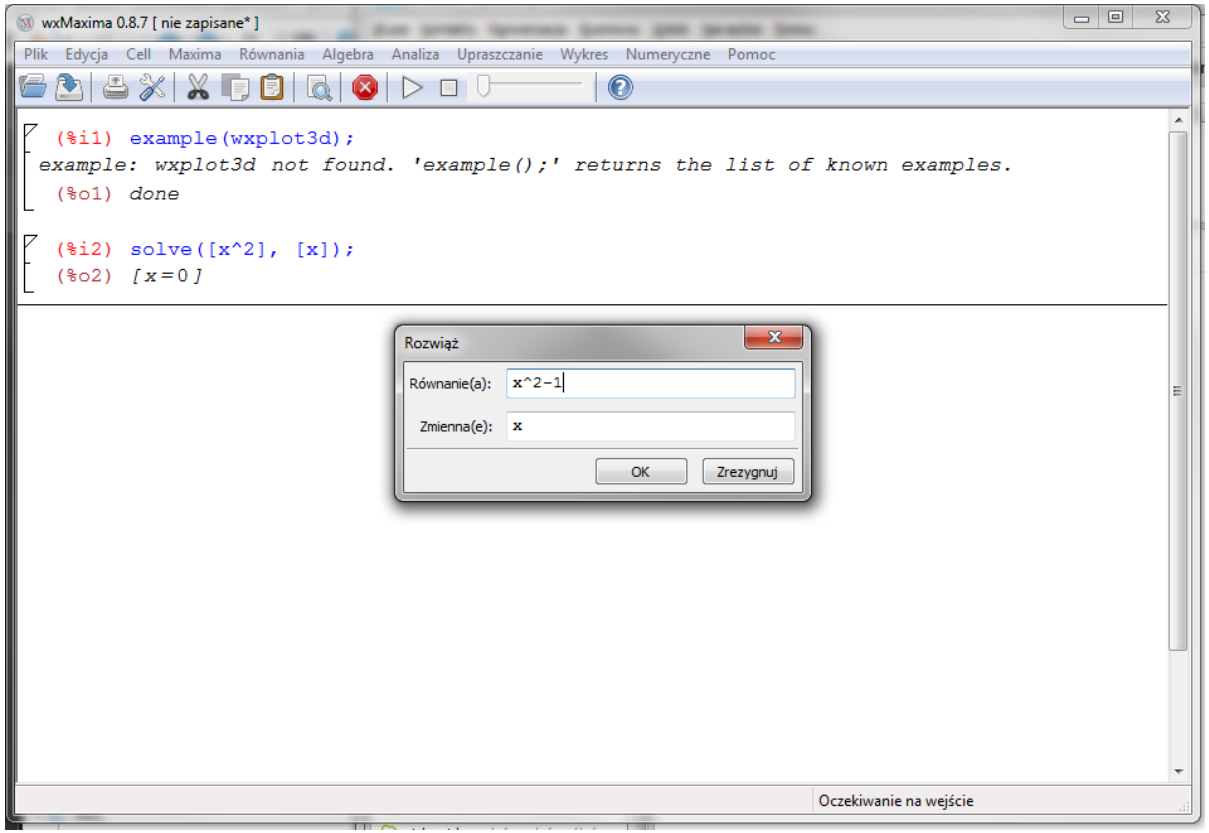
1968 MIT Departamentu Energii USA programu **Macsyma**

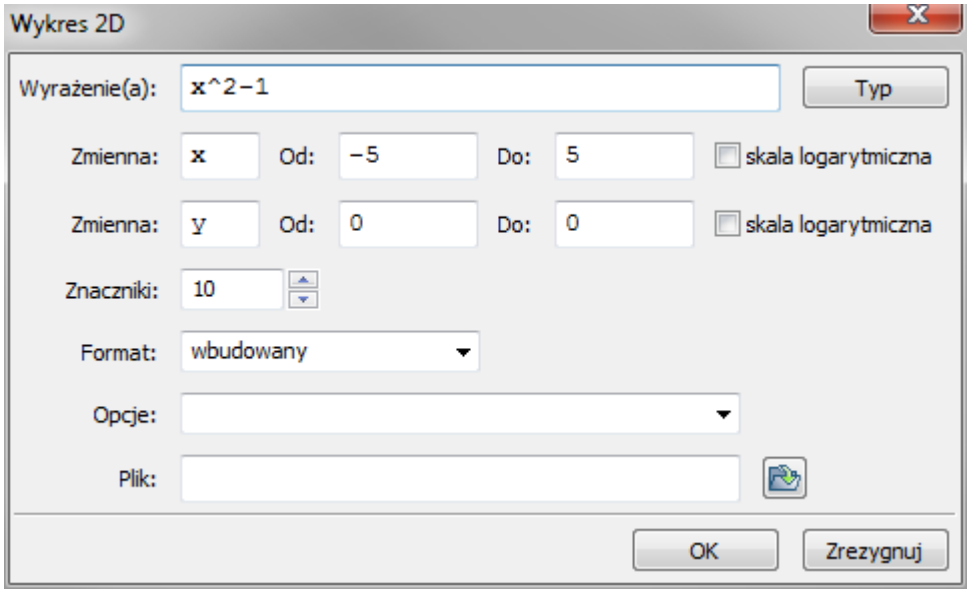
1988 GPL



Maxima

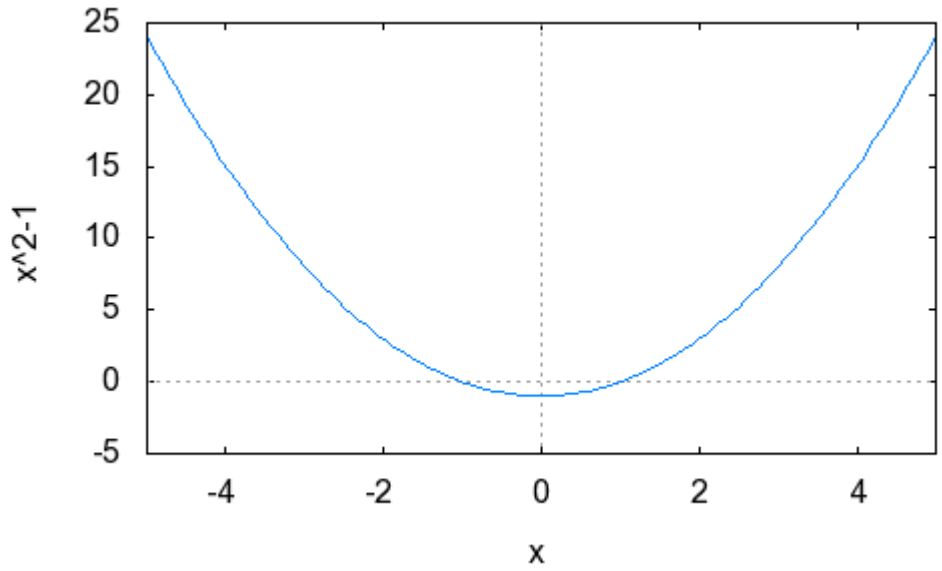
Rozwiązywanie równań





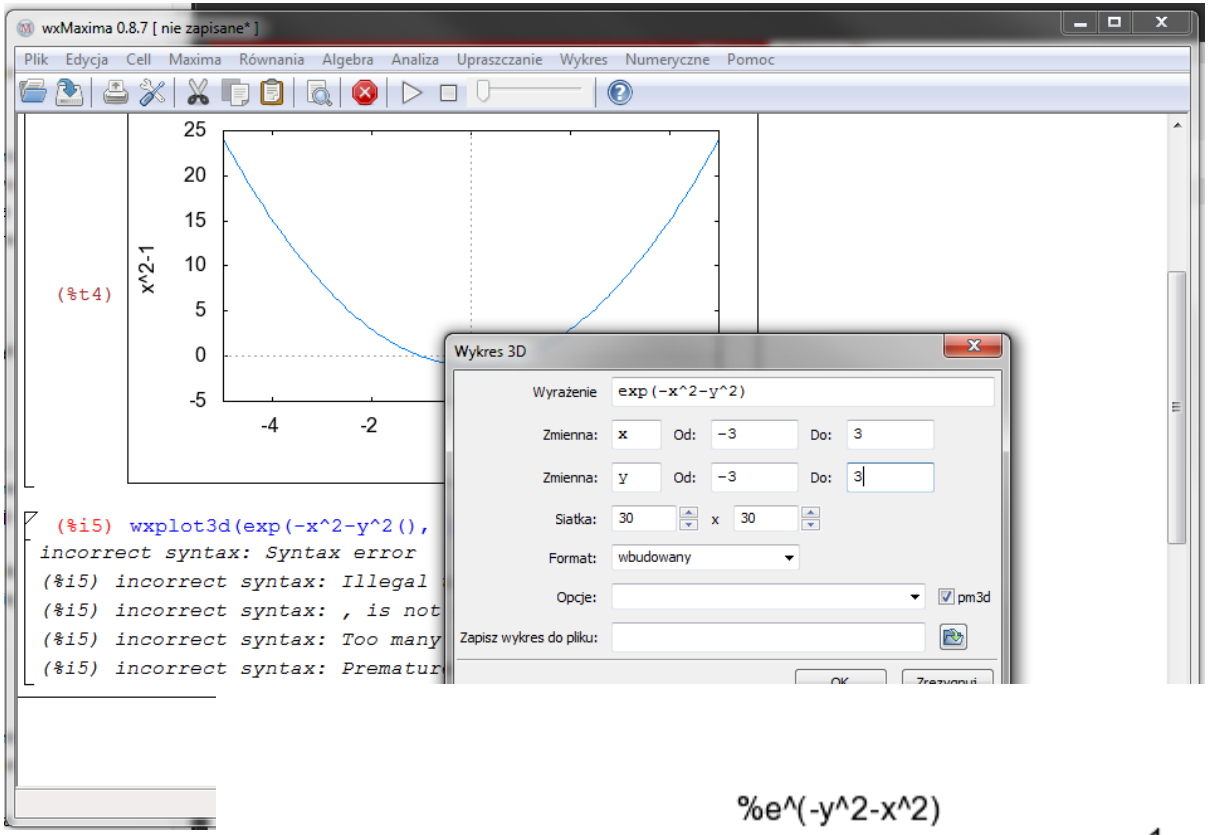
Maxima

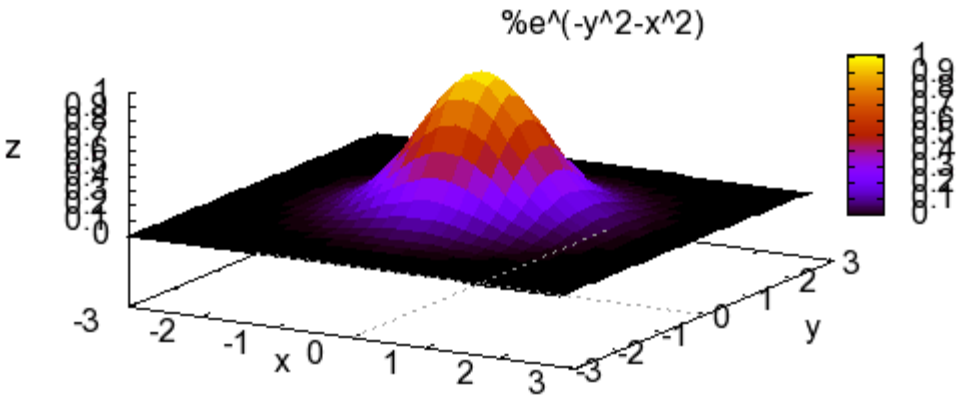
Wykresy 2D

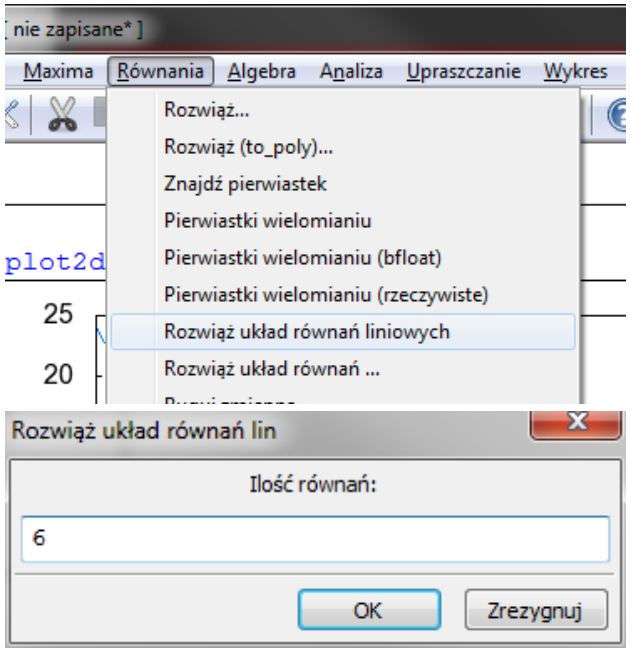


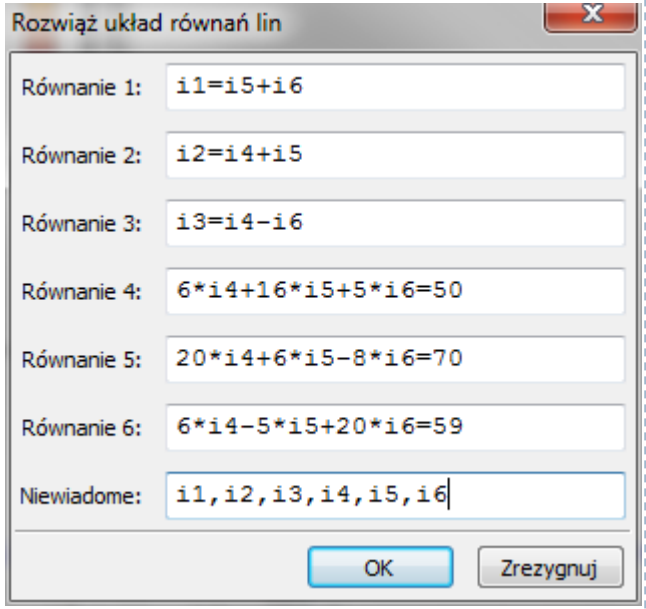
Maxima

Wykresy 3D





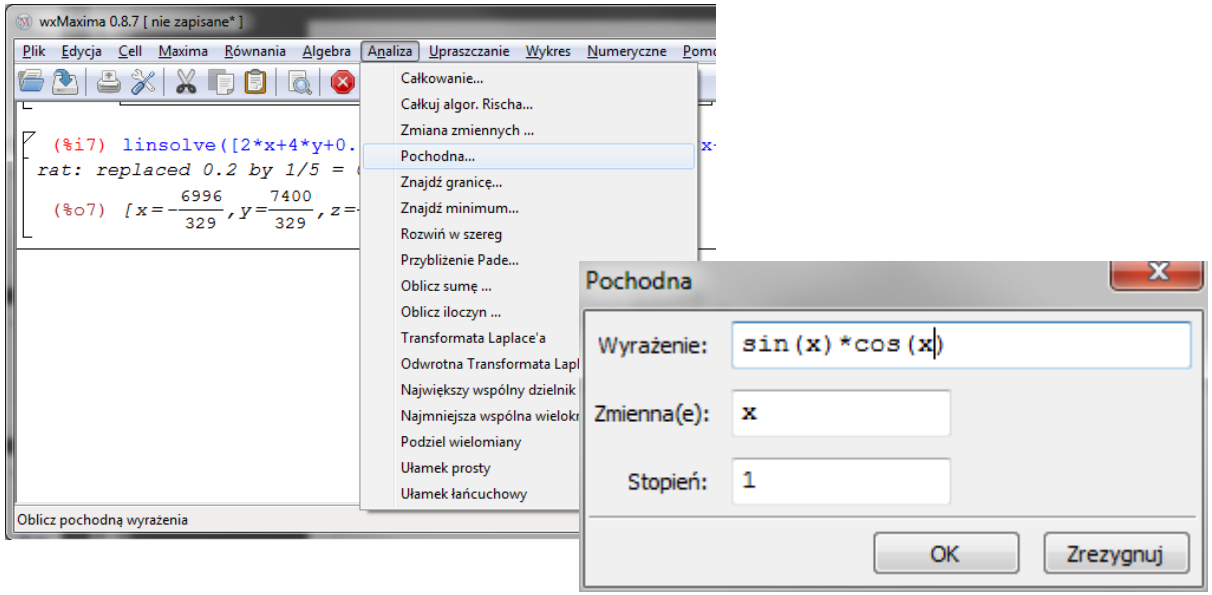


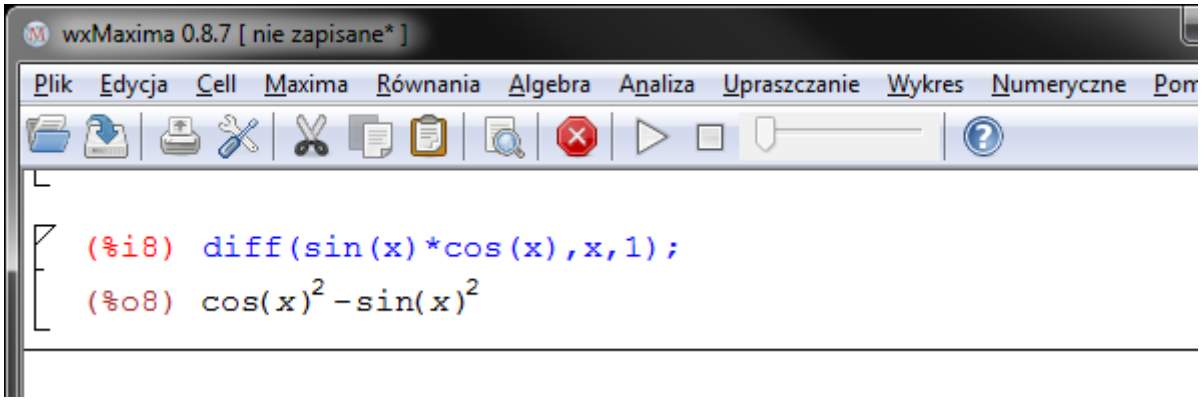


Maxima

Rozwiązywanie równań liniowych

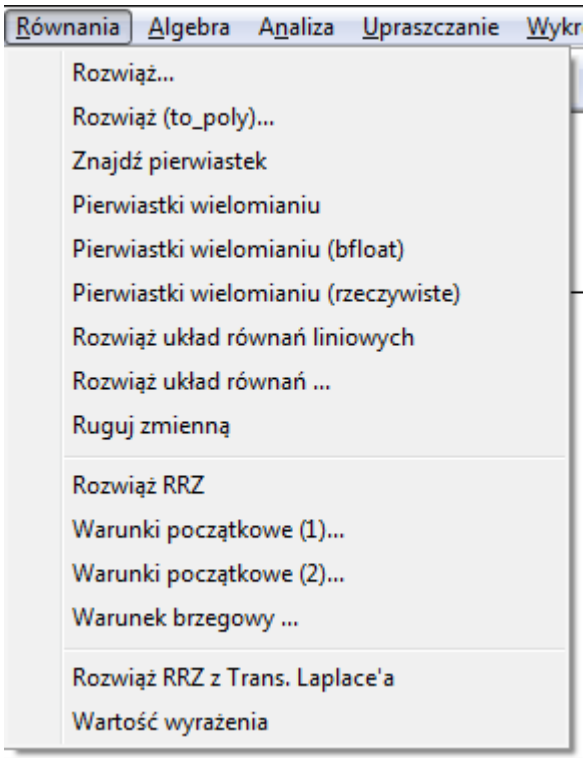
```
(%i7)  linsolve([i1=i5+i6, i2=i4+i5, i3=i4-i6, 6*i4+16*i5+5*i6=50, 20*i4+6*i5-8*i6=70, 6*i4-5*i5+20*i6=59], [i1,i2,i3,i4,i5,i6]);
(%o7)  [ i1 = 3 , i2 = 5 , i3 = 2 , i4 = 4 , i5 = 1 , i6 = 2 ]
```

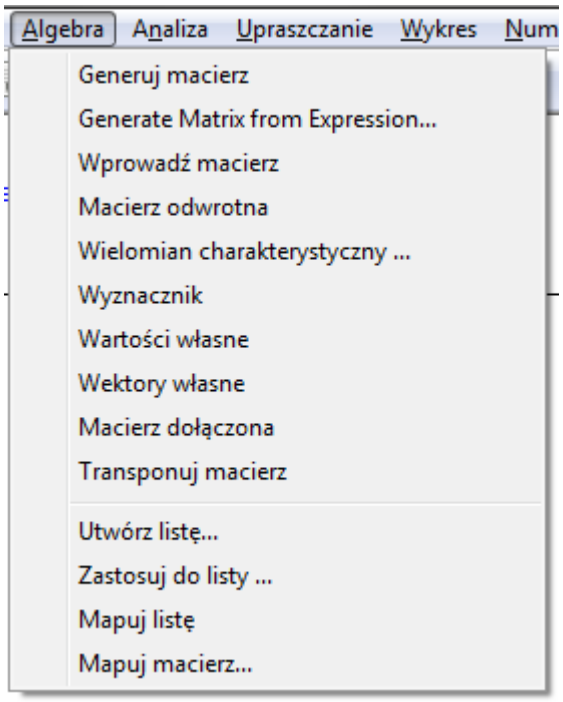




Maxima

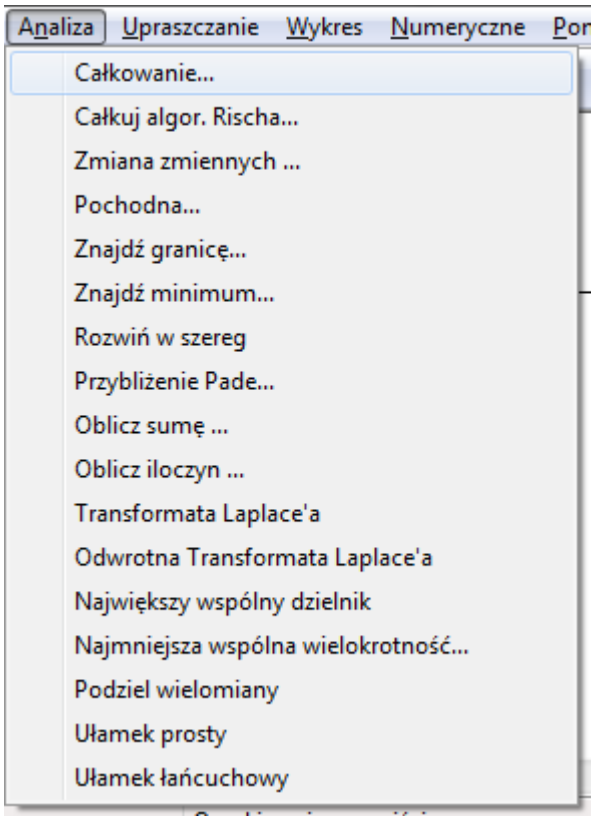
Pochodne

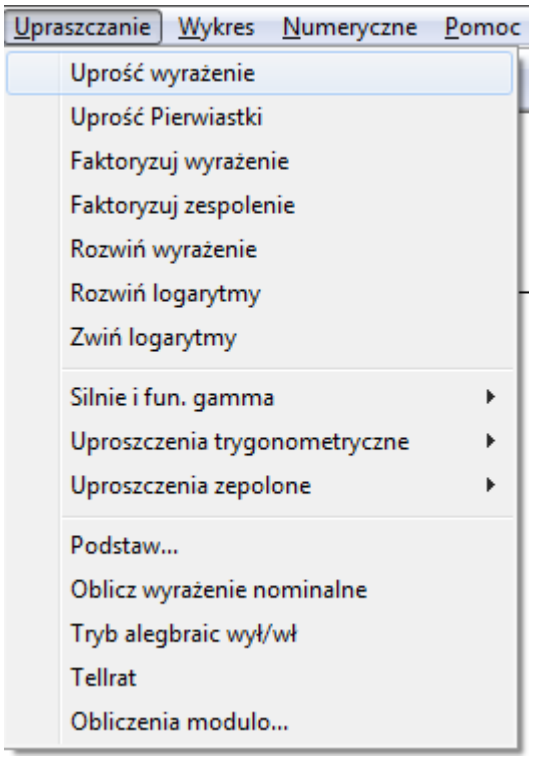


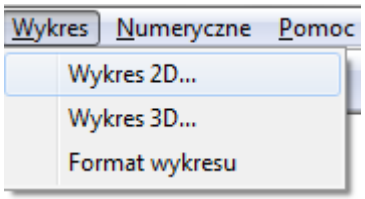


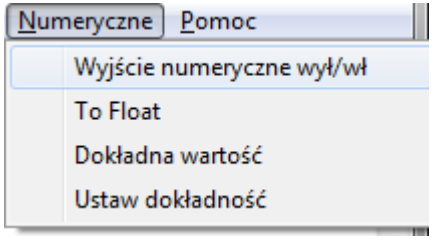
Maxima

Funkcje







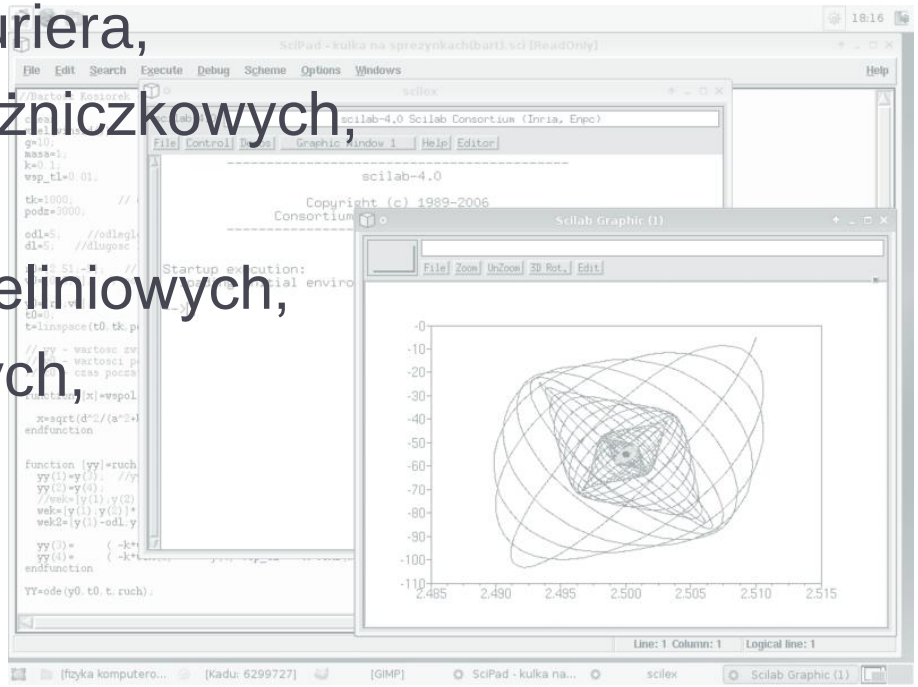


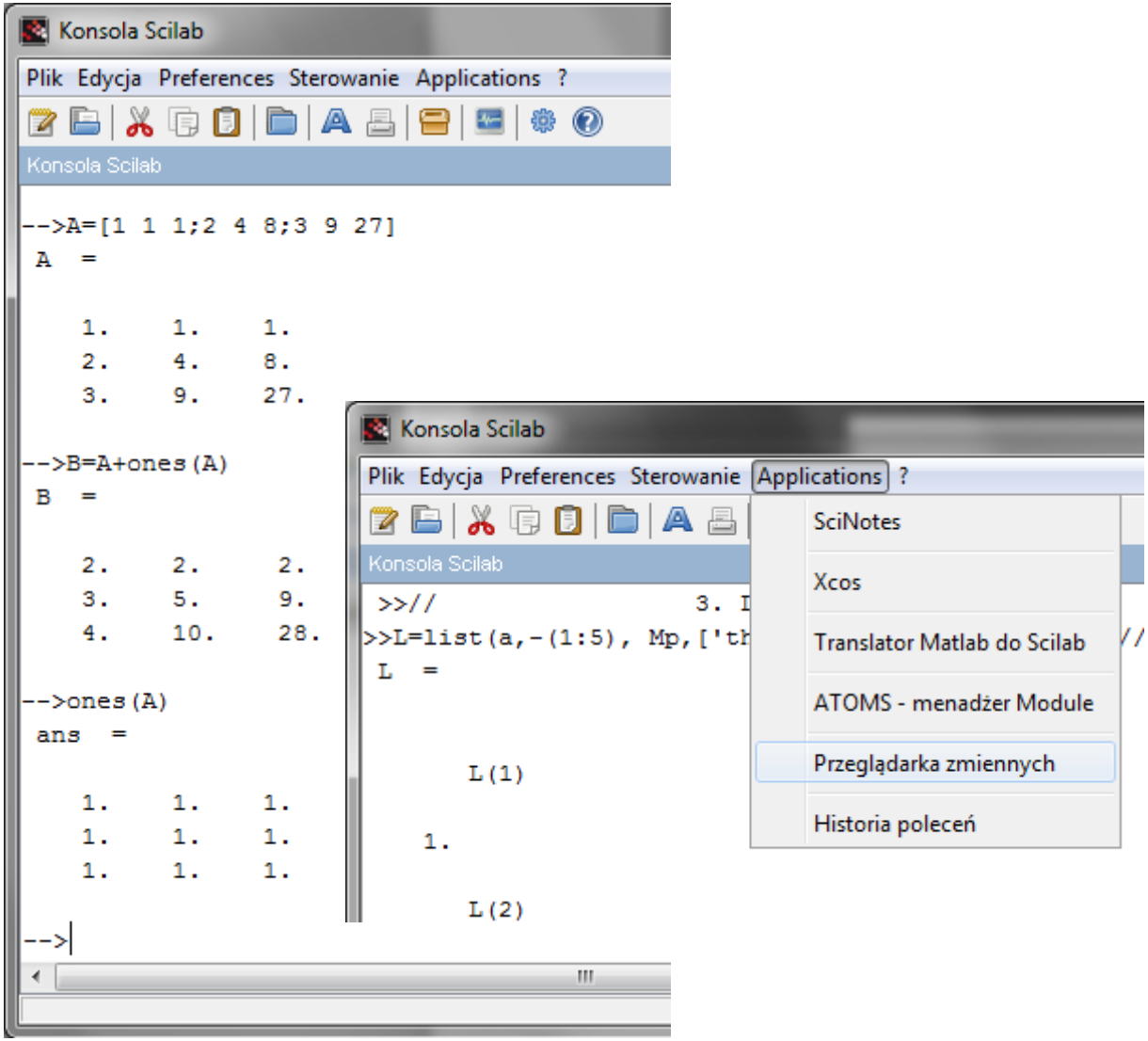
Maxima

Funkcje

Obliczenie numeryczne - Scilab

- SCILAB I.N.R.I.A. (Institut National de Recherche en Informatique et Automatique)
  - rozwiązywanie układów liniowych,
  - wyznaczanie wartości własnych, wektorów własnych,
  - szybka transformacja Fouriera,
  - rozwiązywanie równań różniczkowych,
  - algorytmy optymalizacji,
  - rozwiązywanie równań nieliniowych,
  - generowanie liczb losowych,

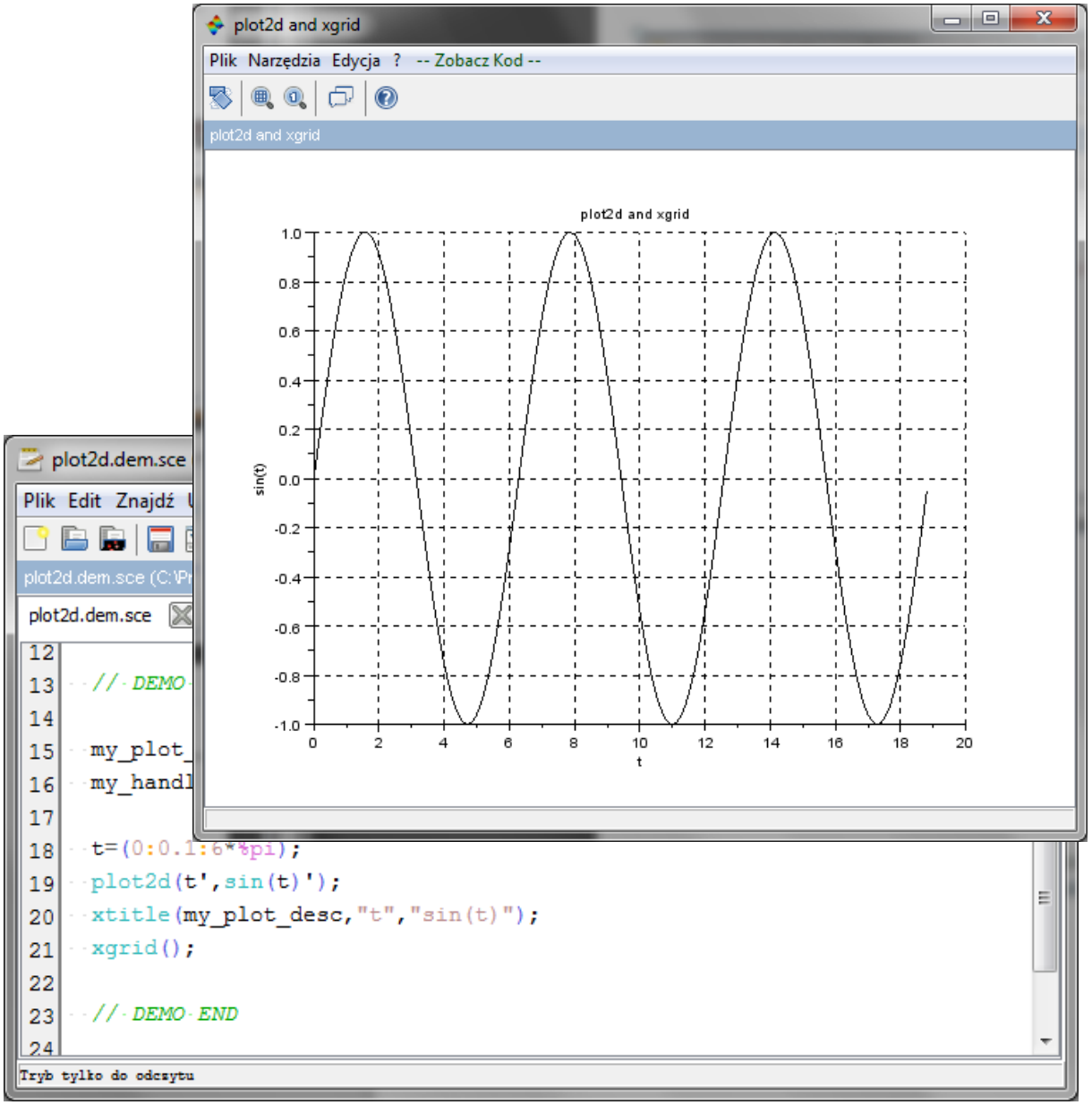




Scilab

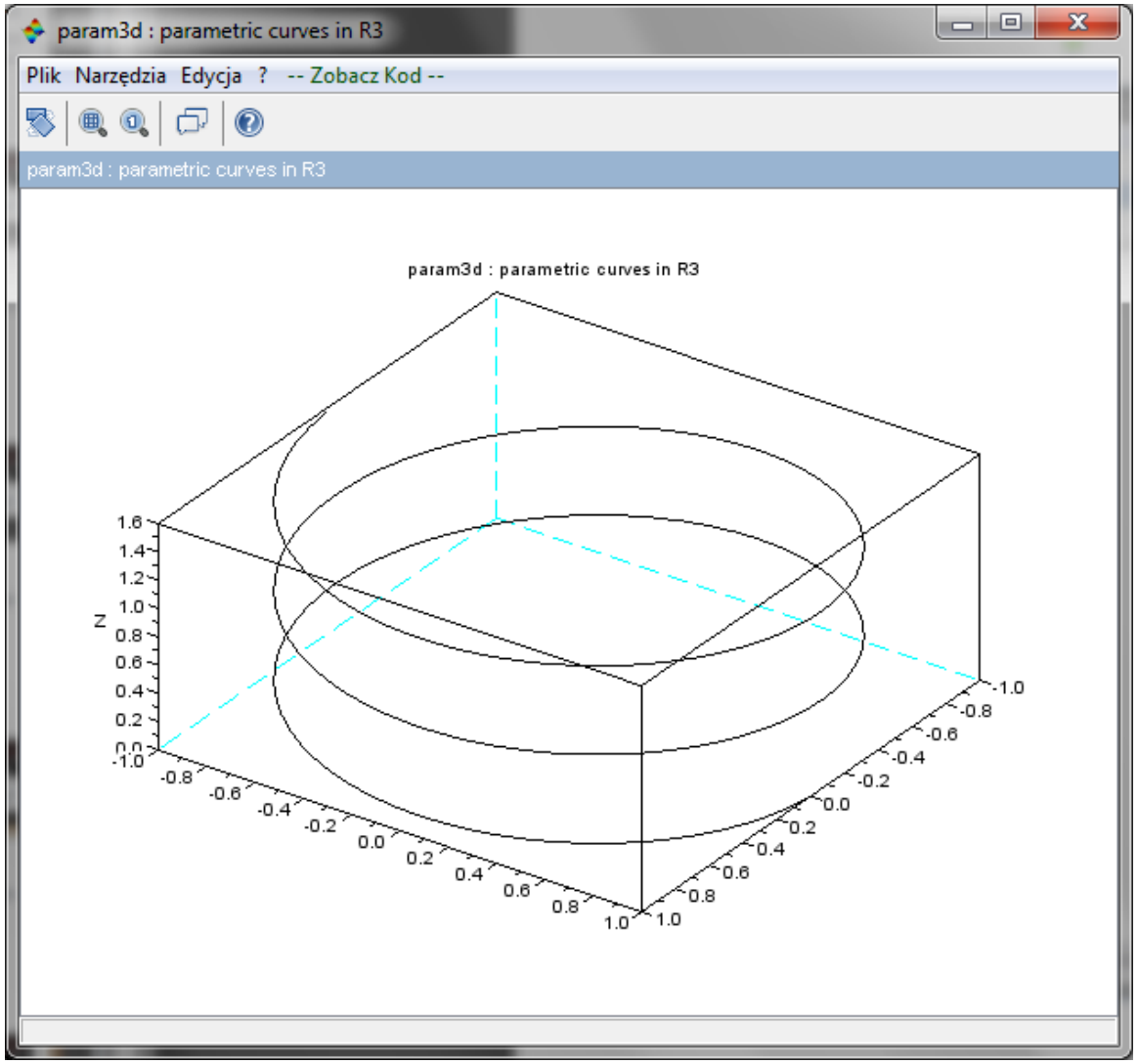
Operacje na macierzach

- dodawanie, odejmowanie, mnożenie
- macierze jednostkowe



Scilab

Rysowanie przebiegów funkcji 2D



Scilab

Rysowanie przebiegów funkcji 3D

SMathStudio

http://smath.info/live/?lang=pol

Analiza i wizualizacja danych

- AutoSignal
- DADISP
- Grapher
- IRISExplorer
- MapViewer
- **Origin**
- PeakFit
- SigmaScan
- SigmaPlot
- SigmaStat