

Rozwiązanie układu równań

Given

$$I_1 = I_5 + I_6$$

$$I_2 = I_4 + I_5$$

$$I_3 = I_4 - I_6$$

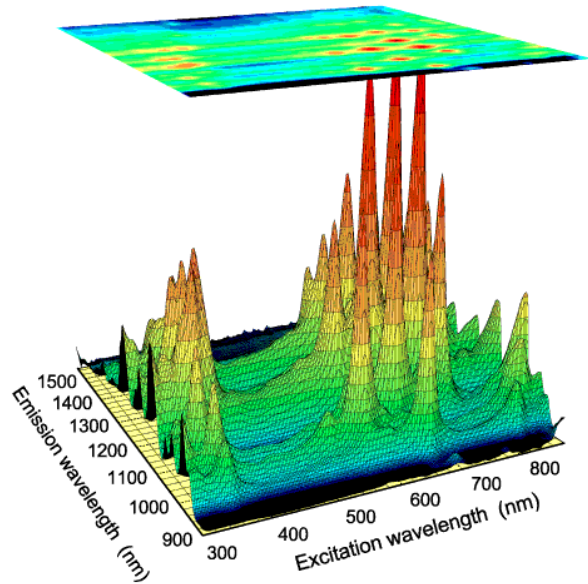
$$R_2 \cdot I_4 + (R_1 + R_2 + R_5) \cdot I_5 + R_1 \cdot I_6 = E_1 + E_2 - E_5$$

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

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

Find($I_1, I_2, I_3, I_4, I_5, I_6$) \rightarrow

$$\begin{pmatrix} 3 \cdot V \\ \Omega \\ 5 \cdot V \\ \Omega \\ 2 \cdot V \\ \Omega \\ 4 \cdot V \\ \Omega \\ V \\ \Omega \end{pmatrix}$$



Obliczenia inżynierskie

oprogramowanie matematyczne

Mathcad – środowisko pracy

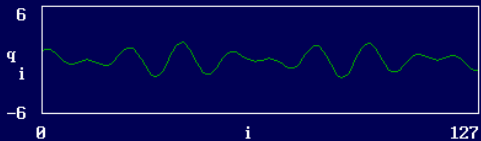
► Mathcad 15.0, Mathcad Prime 1.0

JFFFTILT.MCD1

FILTERING A NOISY SIGNAL WITH FFT

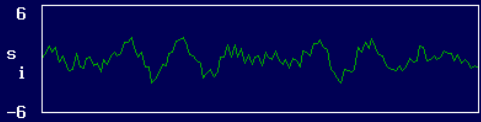
Define the signal: $i := 0 .. 127$

$$q_i := \sin\left[\frac{i}{128} \cdot 14 \cdot \pi\right] + \cos\left[\frac{i}{128} \cdot 19 \cdot \pi\right]$$



Add some noise:

$$s_i := q_i + \text{rnd}(2) - 1$$



Trade-off analysis for movable robot armature

Page 3 of 4

MAW, Aug 1, 2010

We shall look t a trade-off between using HDPE and ASTM A36 steel

Evaluating the maximum stress and as a function of thickness (thickness in m, σ in Pa):

$$\sigma_{max}(t) := \frac{T_{min}}{b \cdot t^3} \cdot \left(\frac{t}{2}\right)$$

FOR HDPE $\sigma_{HDPE} := 26 \cdot MPa$ $Mk_{HDPE} := \frac{\sigma_{HDPE}}{2 \cdot Pa} = 1.3 \cdot 10^7$

FOR A36 $\sigma_{A36} := 250 \cdot MPa$ $Mk_{A36} := \frac{\sigma_{A36}}{2 \cdot Pa} = 1.25 \cdot 10^8$

For HDPE, a 2x safety factor for a 350lbf load can be achieved with an armature that is roughly 0.0203m (~0.799in) thick, versus a 0.00664m (~0.26in) thick armature for A36. However, let's look at the mass of each:

Parametric Technology Corporation's

PTC Mathcad Prime 1.0

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



Mathcad[®]
Prime 1.0

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Mathcad Prime 1.0

The screenshot displays the Mathcad Prime 1.0 interface. The main workspace contains the following text and equations:

Obliczenie punktu pracy magnesu trwałego

Parametry magnesu trwałego

indukcja remanencji

$$B_r := 1.195 \text{ T}$$

natężenie pola koercji

$$H_c := 899 \frac{\text{kA}}{\text{m}}$$

siła magnetyczna magnesu o wysokości

$$h_m := 5 \text{ mm}$$
$$\text{MMF} := H_c \cdot h_m$$
$$\text{MMF} = (4.495 \cdot 10^3) \text{ A}$$

The interface includes a menu bar with options like Math, Input/Output, Functions, and a toolbar with various mathematical symbols and operations. A status bar at the bottom shows page 1/1, search and replace fields, and a zoom level of 130%.

Mathcad®
Prime 1.0

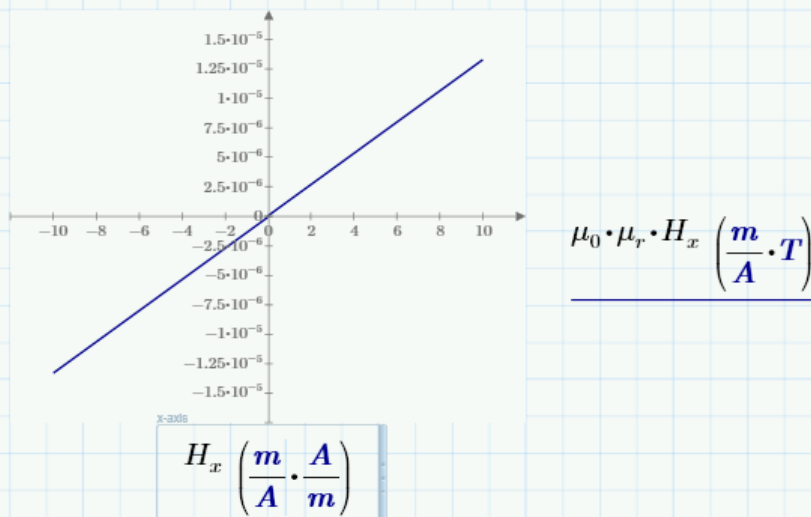
Charakterystyka odmagnesowania MT

$$B_x := B_r + \mu_0$$

These units are not compatible.

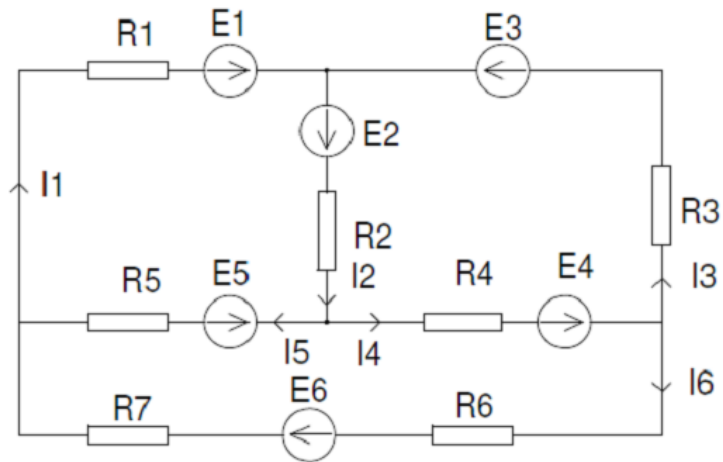
Charakterystyka odmagnesowania MT

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



Mathcad Prime 1.0

Mathcad®
PrimΣ 1.0



Rys. 1. Schemat obwodu elektrycznego prądu stałego.

Równania oczkowe

$$-I_1 \cdot R_1 + E_1 + E_2 - I_2 \cdot R_2 - E_5 + I_5 \cdot R_5 = 0$$

$$-E_3 + I_3 \cdot R_3 - E_4 + I_4 \cdot R_4 + I_2 \cdot R_2 - E_2 = 0$$

$$I_5 \cdot R_5 + E_5 - I_4 \cdot R_4 + E_4 - I_6 \cdot R_6 + E_6 - R_7 \cdot I_6 = 0$$

Równania Kirhoff'a

$$I_1 = I_5 + I_6$$

$$I_2 = I_4 + I_5$$

$$I_3 = I_4 - I_6$$

Mathcad 14/15

Rozwiązanie równań liniowych

Dane

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

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

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

Rozwiązanie układu równań

Given

$$I_1 = I_5 + I_6$$

$$I_2 = I_4 + I_5$$

$$I_3 = I_4 - I_6$$

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

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

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

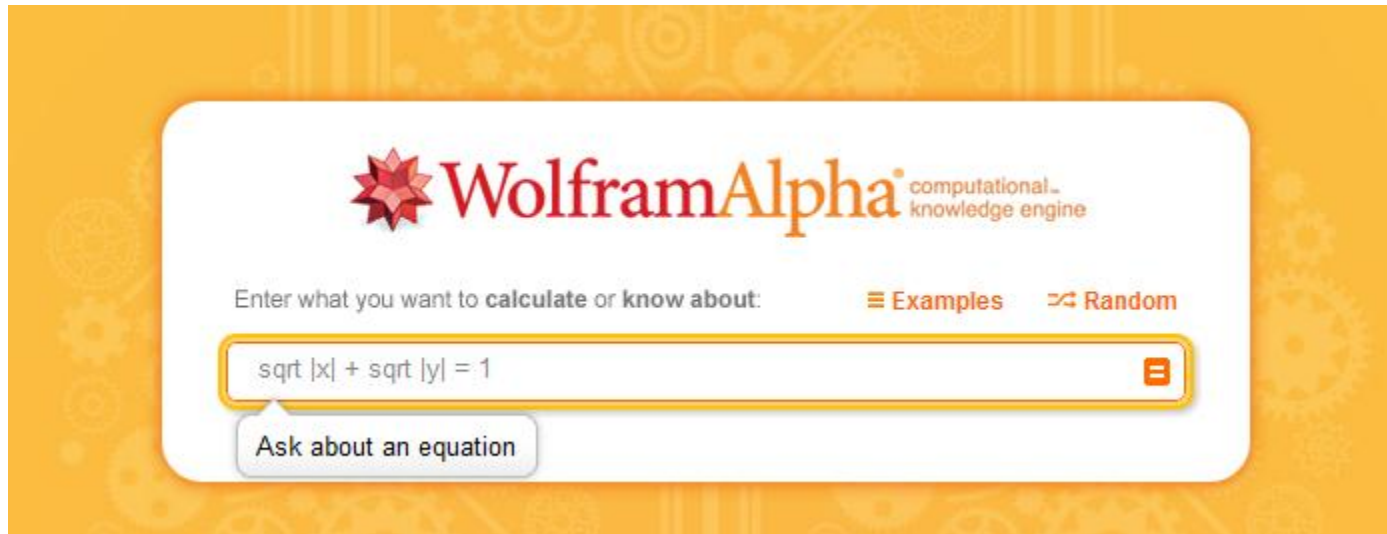
Find($I_1, I_2, I_3, I_4, I_5, I_6$) →

$$\begin{pmatrix} \frac{3 \cdot V}{\Omega} \\ \frac{5 \cdot V}{\Omega} \\ \frac{2 \cdot V}{\Omega} \\ \frac{4 \cdot V}{\Omega} \\ \frac{V}{\Omega} \\ \frac{2 \cdot V}{\Omega} \end{pmatrix}$$

Mathcad 14/15

Rozwiązanie równań liniowych

Obliczenia symboliczne - WolframAlpha



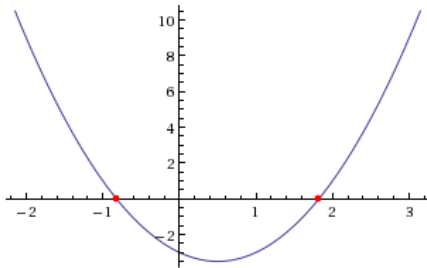
$2x^2 - 2x - 3 = 0$

Examples Random

Input:

$$2x^2 - 2x - 3 = 0$$

Root plot:



Alternate forms:

More

$$2(x - 1)x = 3$$

$$2x^2 = 2x + 3$$

$$\frac{4}{7}\left(x - \frac{1}{2}\right)^2 = 1$$

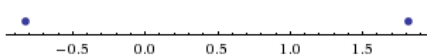
Solutions:

Approximate forms

$$x = \frac{1}{2}(1 - \sqrt{7})$$

$$x = \frac{1}{2}(1 + \sqrt{7})$$

Number line:



Computed by [Wolfram Mathematica](#)

Download as: [PDF](#) | [Live Mathematica](#)

WolframAlpha

Rozwiązanie równań liniowych

d[sin(x),x]



[Examples](#) [Random](#)

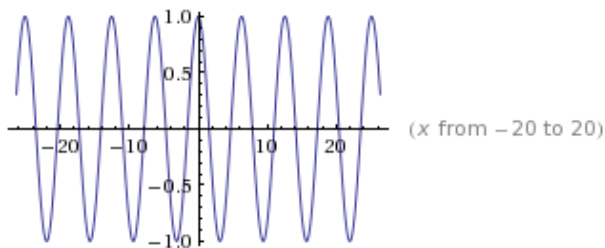
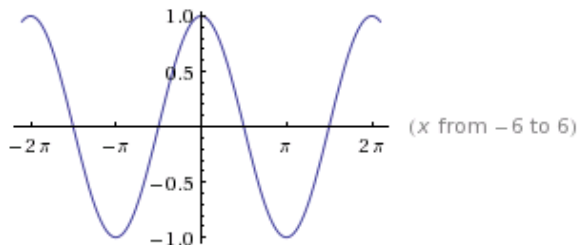
Assuming "d" is referring to derivative computations | Use as a variable instead

Derivative:

[Show steps](#)

$$\frac{d}{dx}(\sin(x)) = \cos(x)$$

Plots:



WolframAlpha

Rozwiązanie równań różniczkowych

linear fit {{1.3, 2.2},{2.1, 5.8},{3.7, 10.2},{4.2, 11.8}}

Examples Random

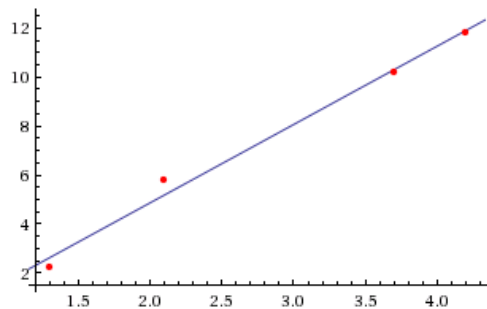
Input interpretation:

fit	data	{{1.3, 2.2}, {2.1, 5.8}, {3.7, 10.2}, {4.2, 11.8}}
	model	linear function

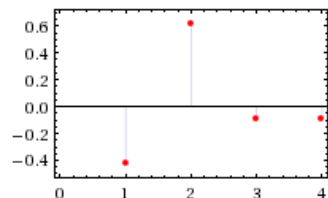
Least-squares best fit:

$$3.19383x - 1.52256$$

Plot of the least-squares fit:



Plot of the residuals:



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WolframAlpha

Regresja liniowa

exponential fit 0.783,0.552,0.383,0.245,0.165,0.097

Examples Random

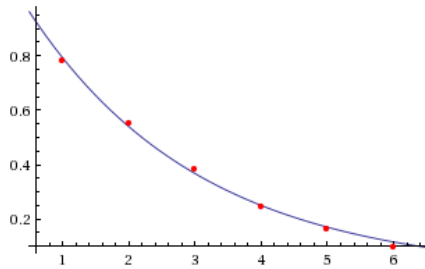
Input interpretation:

fit	data	{0.783, 0.552, 0.383, 0.245, 0.165, 0.097}
	model	exponential

Least-squares best fit:

$$1.16548 e^{-0.384867x}$$

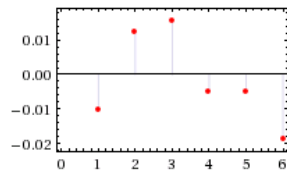
Plot of the least-squares fit:



Fit diagnostics:

AIC	BIC	R^2	adjusted R^2
-29.7907	-30.4154	0.999223	0.998835

Plot of the residuals:



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WolframAlpha

Regresja eksponentialna

plot sin x cos y

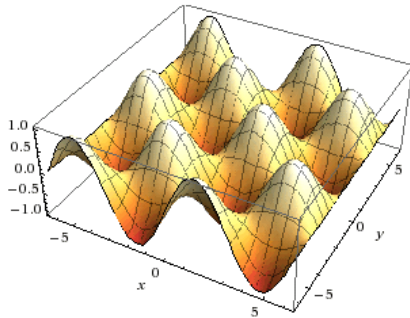
Examples Random

Input interpretation:

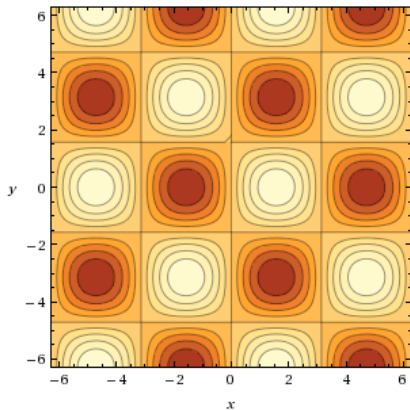
plot $\sin(x) \cos(y)$

3D plot:

Show contour lines



Contour plot:



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WolframAlpha

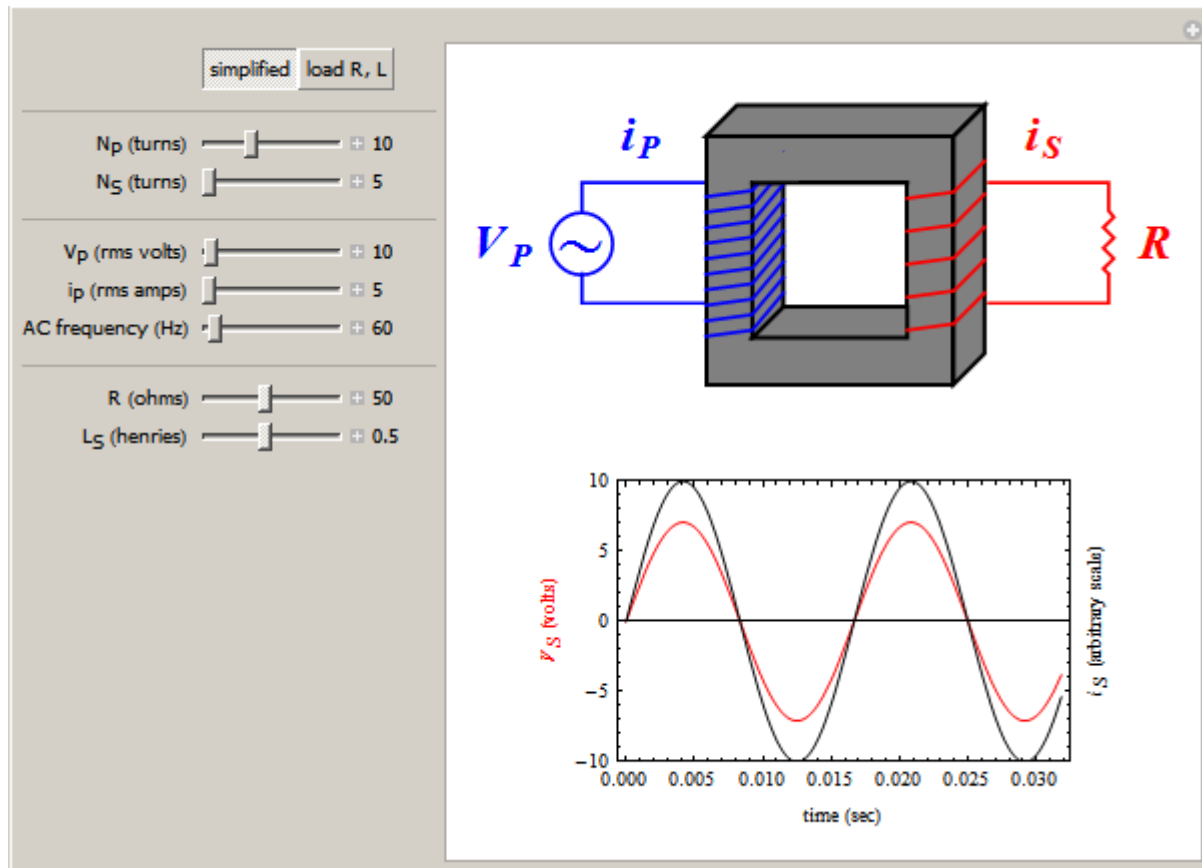
Wykresy funkcji 2D 3D

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



poland



[Examples](#) [Random](#)

Assuming "poland" is a country | [Use as a book](#) instead

Input interpretation:

Poland

Name:

[More](#)

full name	Republic of Poland
full native name	Rzeczpospolita Polska
internet code	.pl

Flag:

[Larger image](#)



Location:

[Show mesh](#)



WolframAlpha

Informacje geograficzne

12A, 110V

[Examples](#) [Random](#)

Input information:

12 A (amperes)

110 V (volts)

Ohm's law:

Input values:

electric current 12 A (amperes)

voltage 110 V (volts)

Result:

[Show formula](#)

electric resistance 9.167 Ω (ohms)

0.009167 k Ω (kilohms)

Electric power formula:

Input values:

electric current 12 A (amperes)

voltage 110 V (volts)

Result:

[Show formula](#)

power 1.32 kW (kilowatts)

1.77 hp (horsepower)

1320 W (watts)

Computed by [Wolfram Mathematica](#)

Download as: [PDF](#) | [Live Mathematica](#)

WolframAlpha

Obwody elektryczne prądu stałego



U.K. men's size 11 shoe in Japanese size

Examples Random



moon

Examples Random



24.09.2011 19:35 - 19.09.2011 8:15

Examples Random

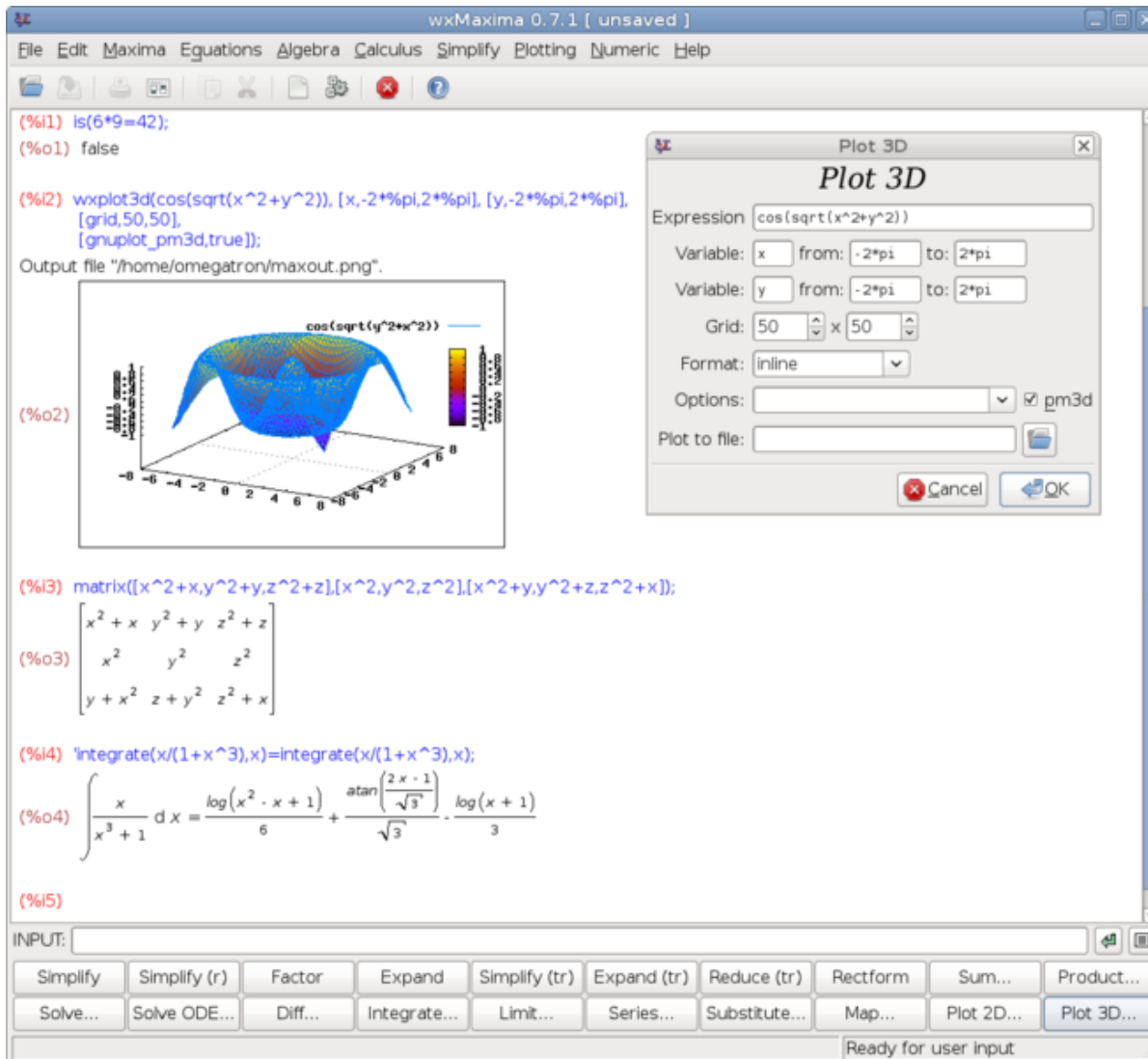
WolframAlpha

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
- ▶ Upraszczenie 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



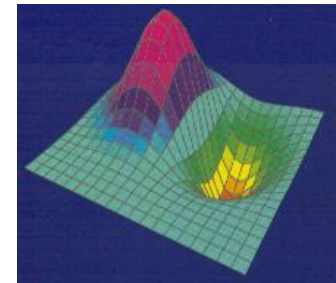


Maxima

1968 MIT Departamentu
Energii USA programu

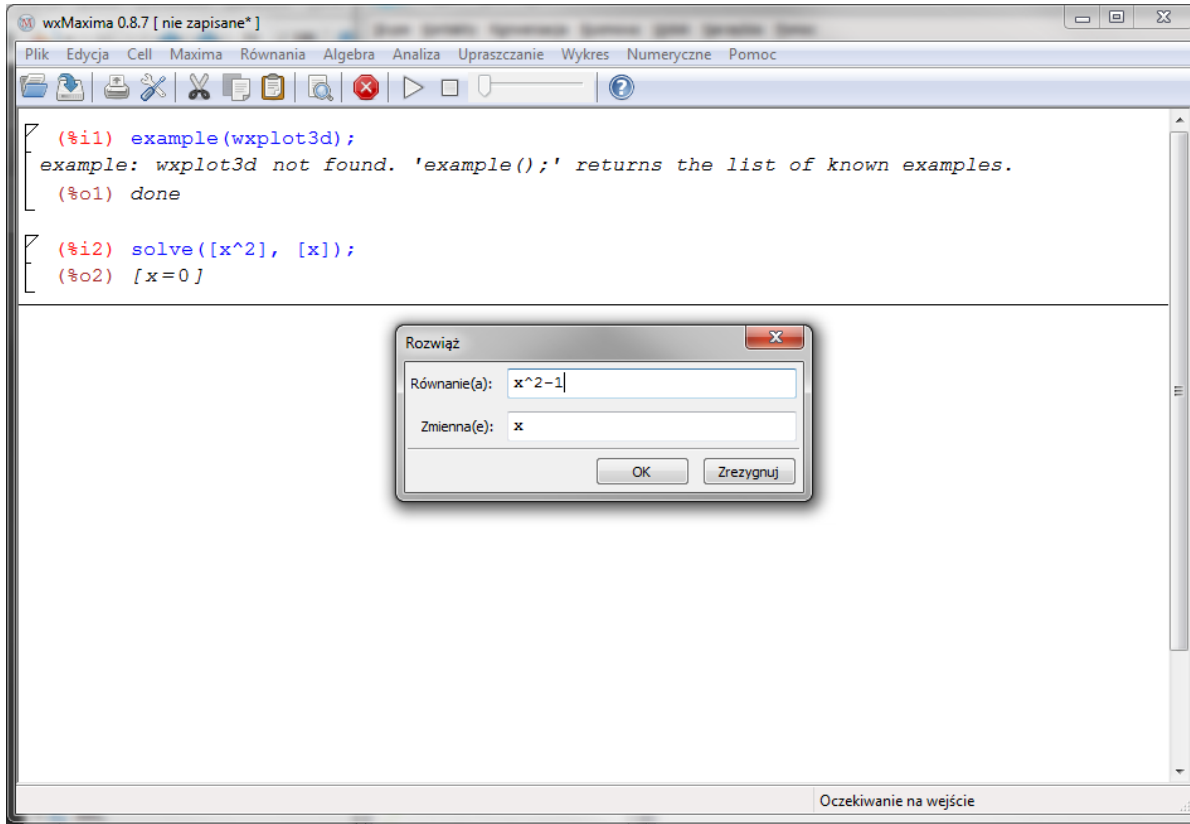
Macsyma

1988 GPL



Maxima

Rozwiązywanie równań



Wykres 2D

Wyrażenie(a):

Zmienna: Od: Do: skala logarytmiczna

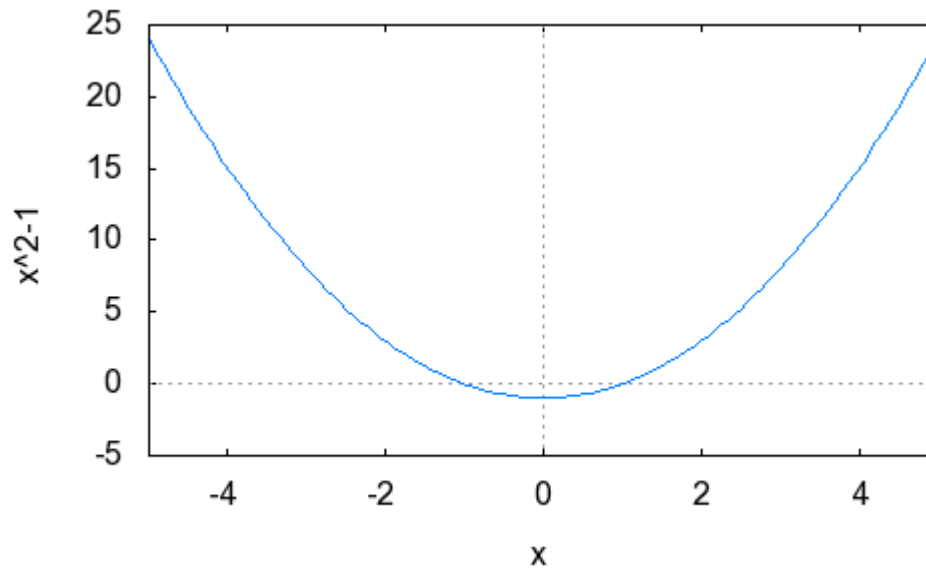
Zmienna: Od: Do: skala logarytmiczna

Znaczniki:

Format:

Opcje:

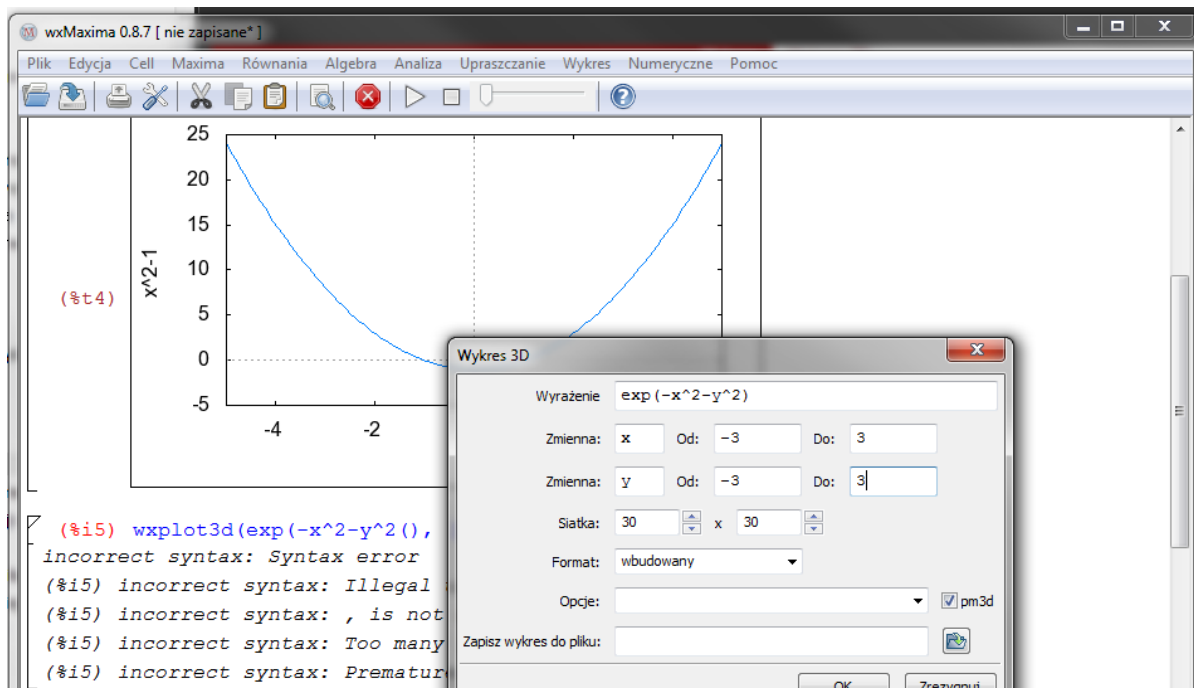
Plik:



Maxima

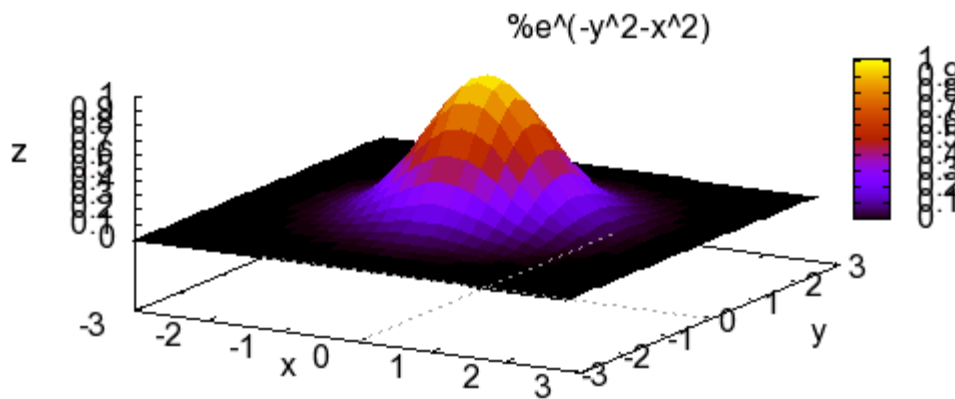
Wykresy 2D

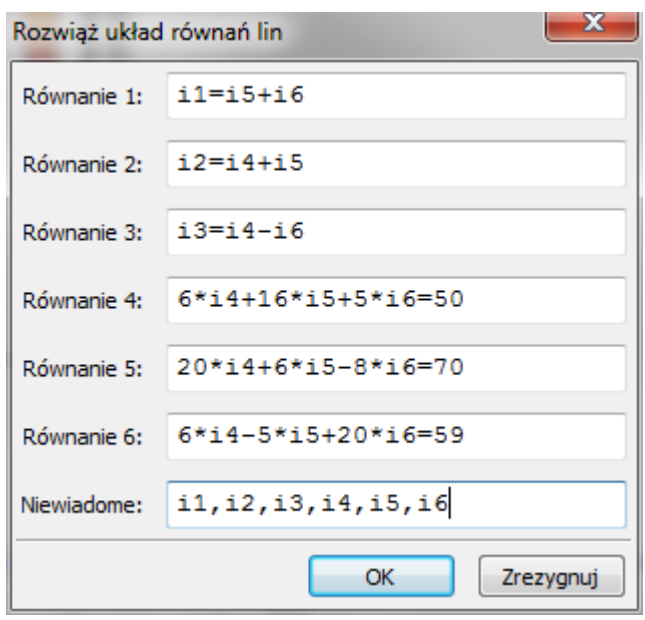
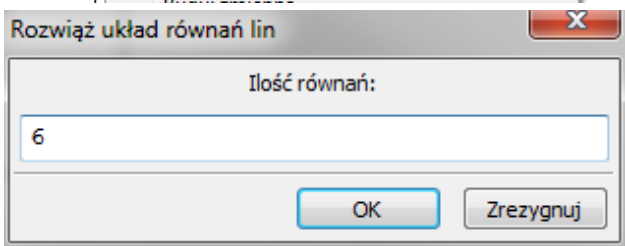
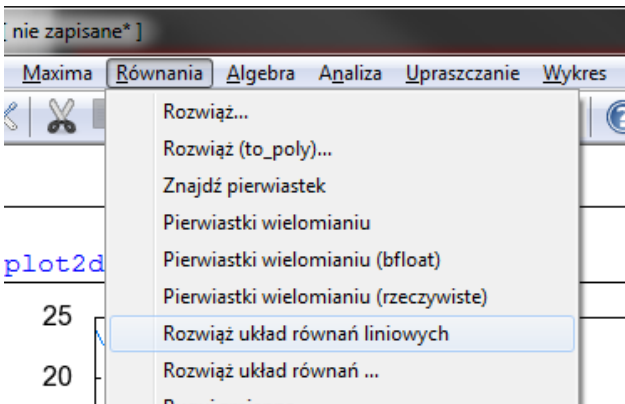




Maxima

Wykresy 3D



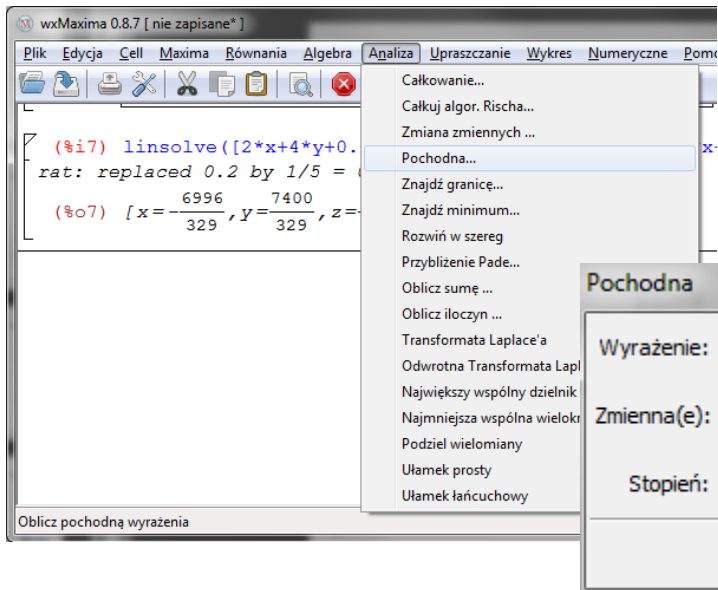


Maxima

Rozwiązywanie równań liniowych

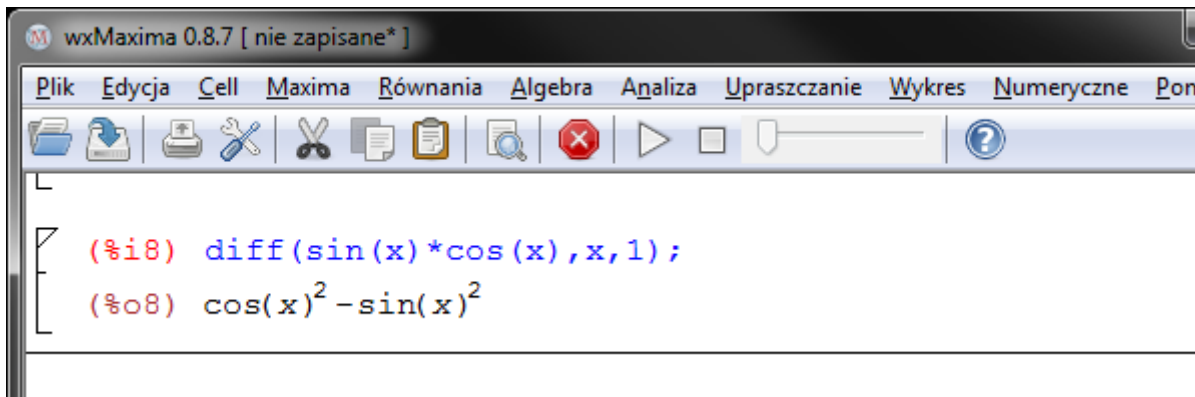


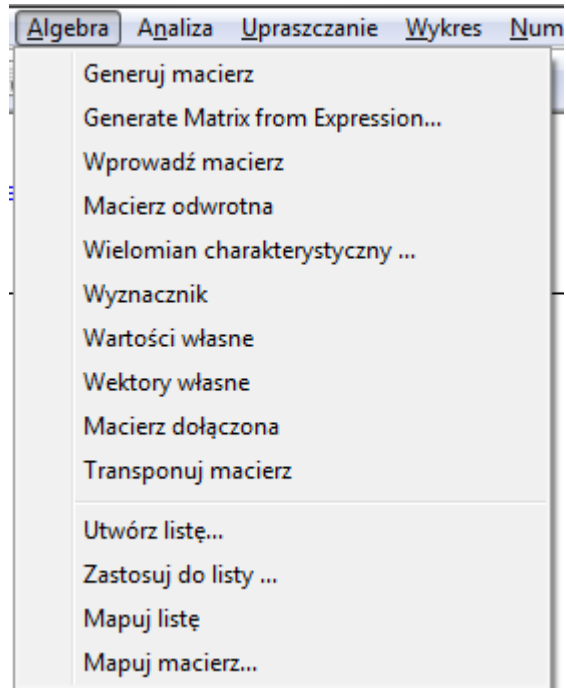
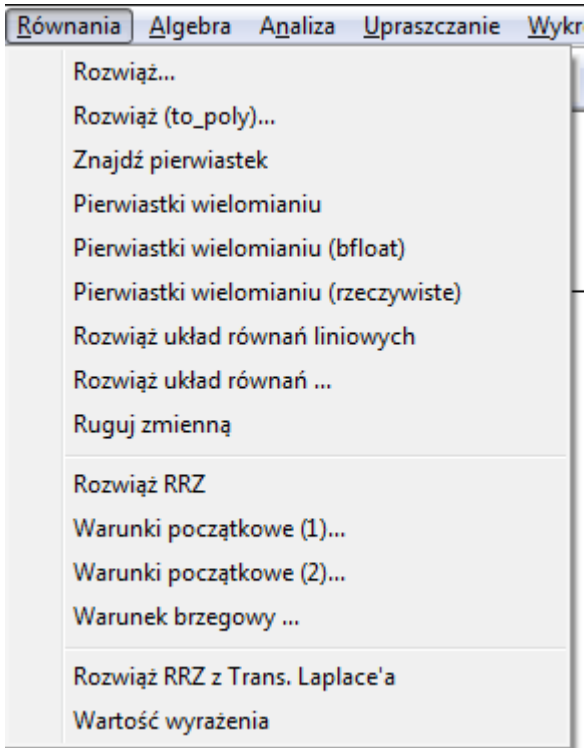
```
(%i7) linsolve([i1=i5+i6, i2=i4+i5, i3=i4-i6, 6*i4+16*i5+5*i6=50, 20*i4+6*i5-8*i6=70, 6*i4-5*i5+20*i6=59], [i1,i2,i3,i4,i5,i6]);  
(%o7) [ i1 = 3 , i2 = 5 , i3 = 2 , i4 = 4 , i5 = 1 , i6 = 2 ]
```

Maxima

Pochodne

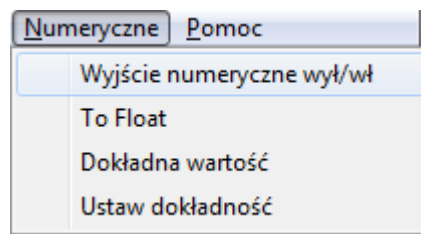
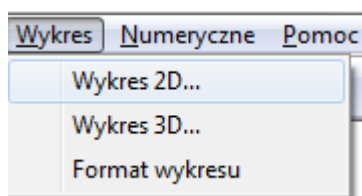
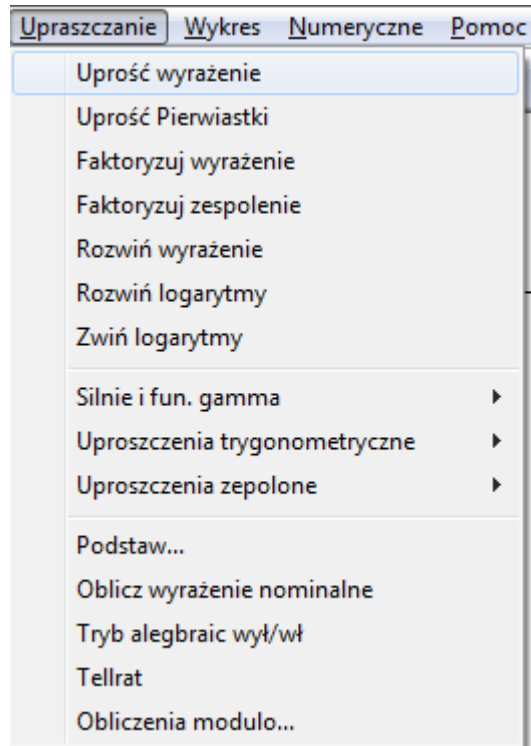
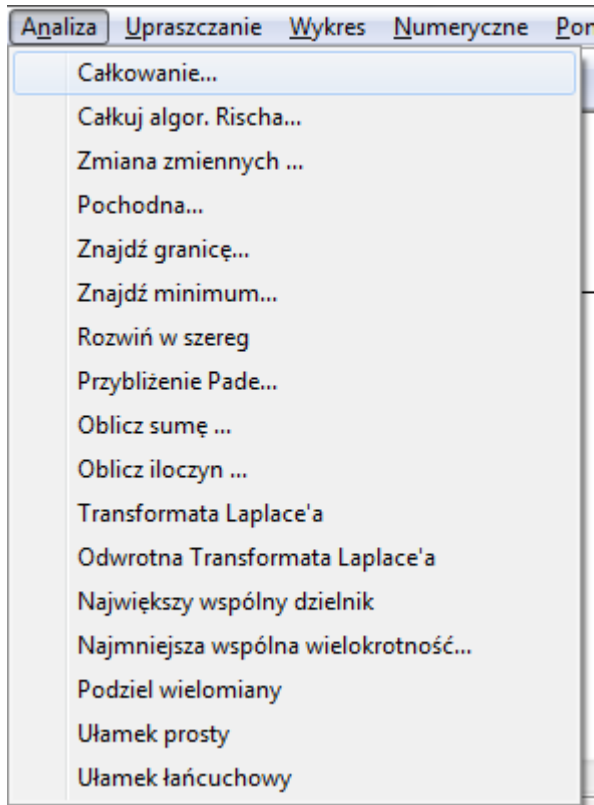




Maxima

Funkcje





Maxima

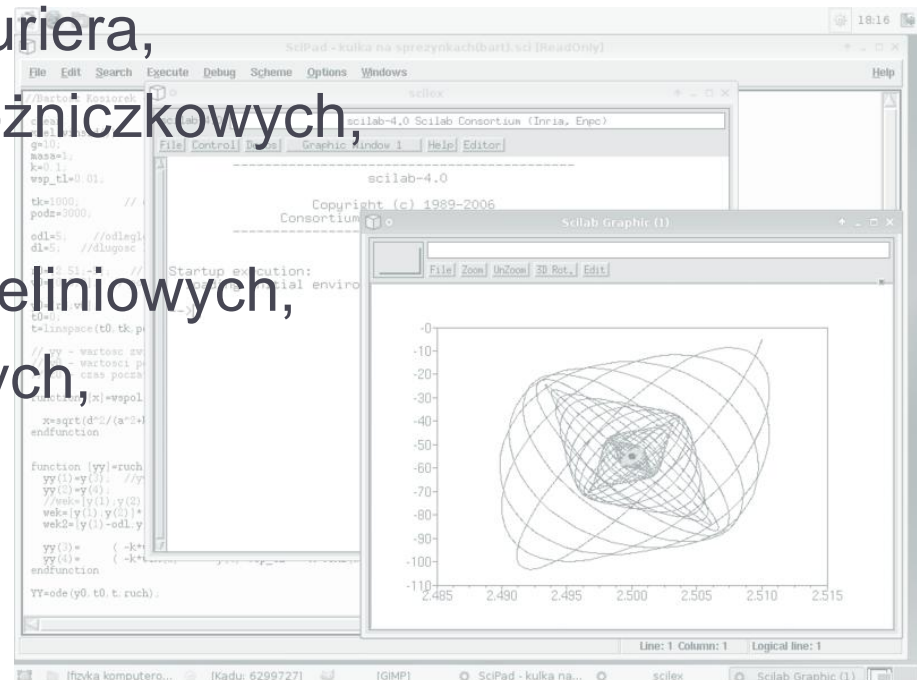
Funkcje



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,



```

Konsola Scilab
Plik Edycja Preferences Sterowanie Applications ?
Konsola Scilab
-->A=[1 1 1;2 4 8;3 9 27]
A =

    1.    1.    1.
    2.    4.    8.
    3.    9.   27.

-->B=A+ones(A)
B =

    2.    2.    2.
    3.    5.    9.
    4.   10.   28.

-->ones(A)
ans =

    1.    1.    1.
    1.    1.    1.
    1.    1.    1.

-->

```

```

Konsola Scilab
Plik Edycja Preferences Sterowanie Applications ?
Konsola Scilab
>> //
>> L=list(a, -(1:5), Mp, ['t'])
L =

    L (1)
    1.
    L (2)

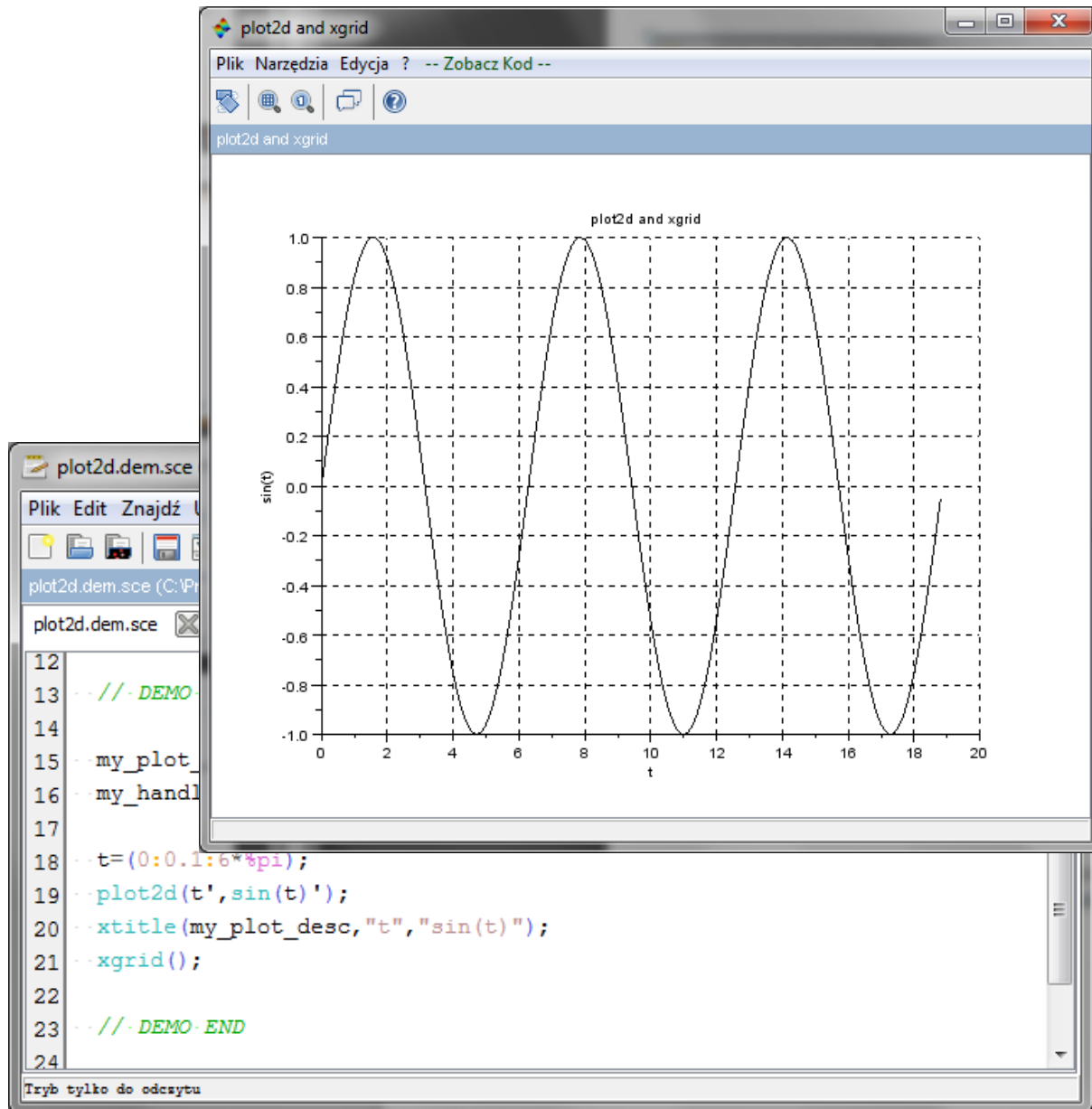
```

Scilab

Operacje na macierzach

- dodawanie, odejmowanie, mnożenie
- macierze jednostkowe

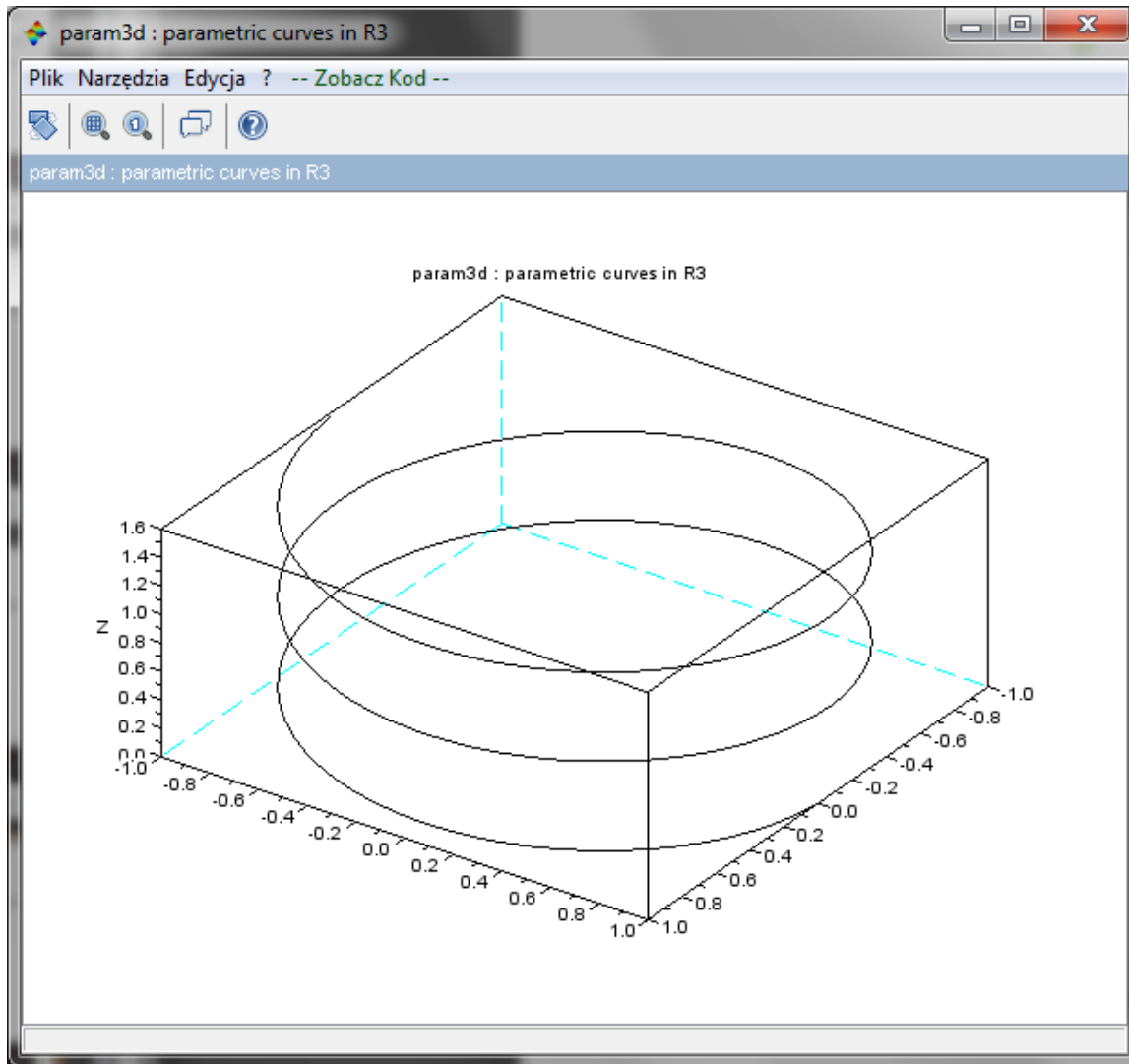




Scilab

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

