Podstawy *Mathematica*.

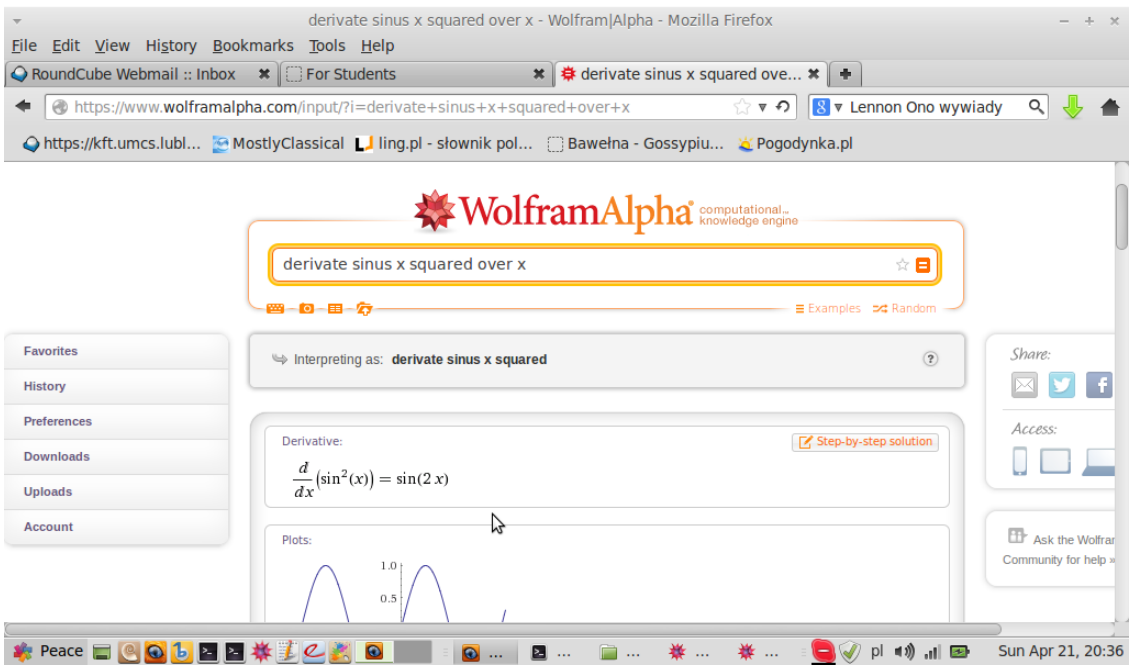
Linki

In[2]:=
```
Import["/home/marek/Documents/praca/studenci/MathematicaOverview/WolframCom.png"]
```

Out[2]=

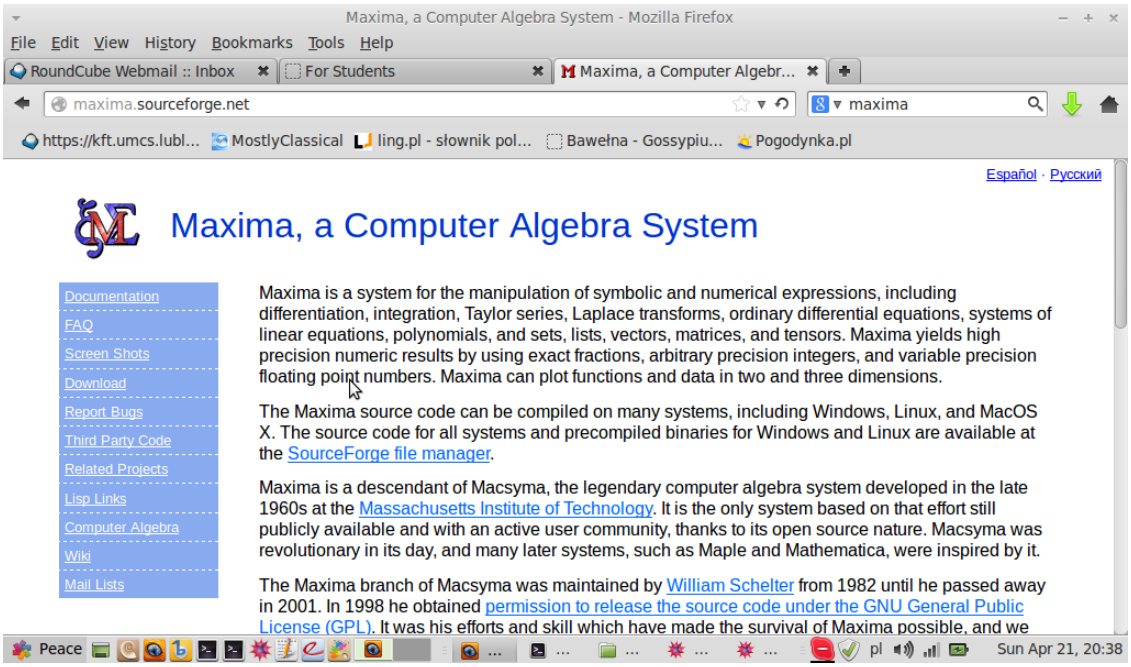
In[3]:=
```
Import["/home/marek/Documents/praca/studenci/MathematicaOverview/WolframAlpha.png"]
```

Out[3]=

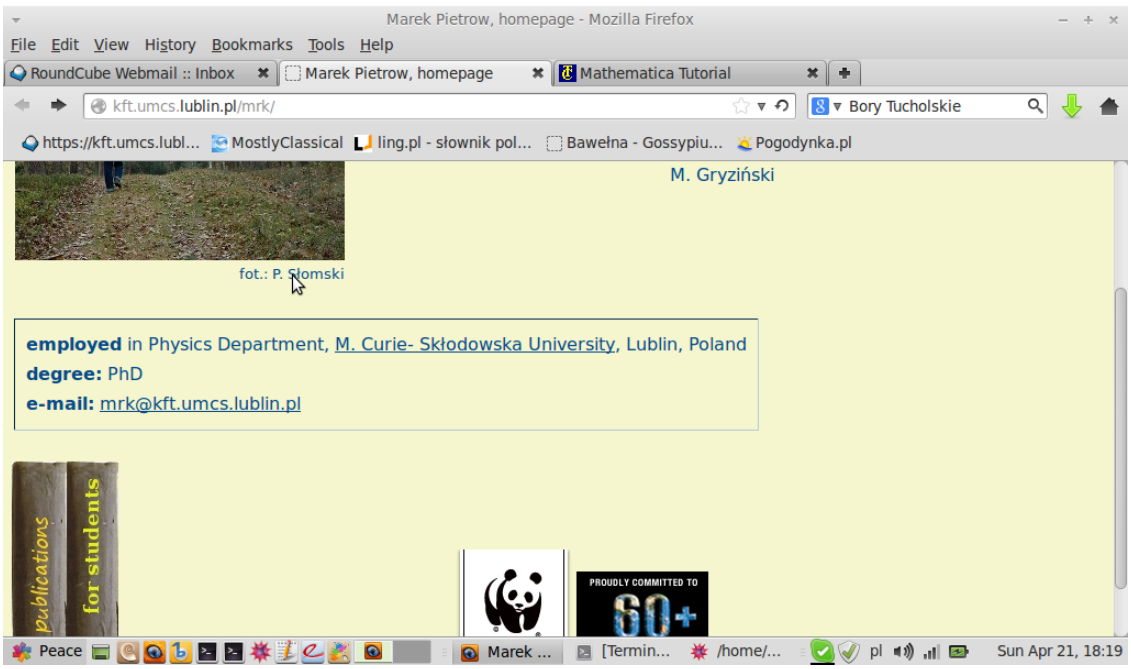


In[4]:=
```
Import["/home/marek/Documents/praca/studenci/MathematicaOverview/Maxima.png"]
```

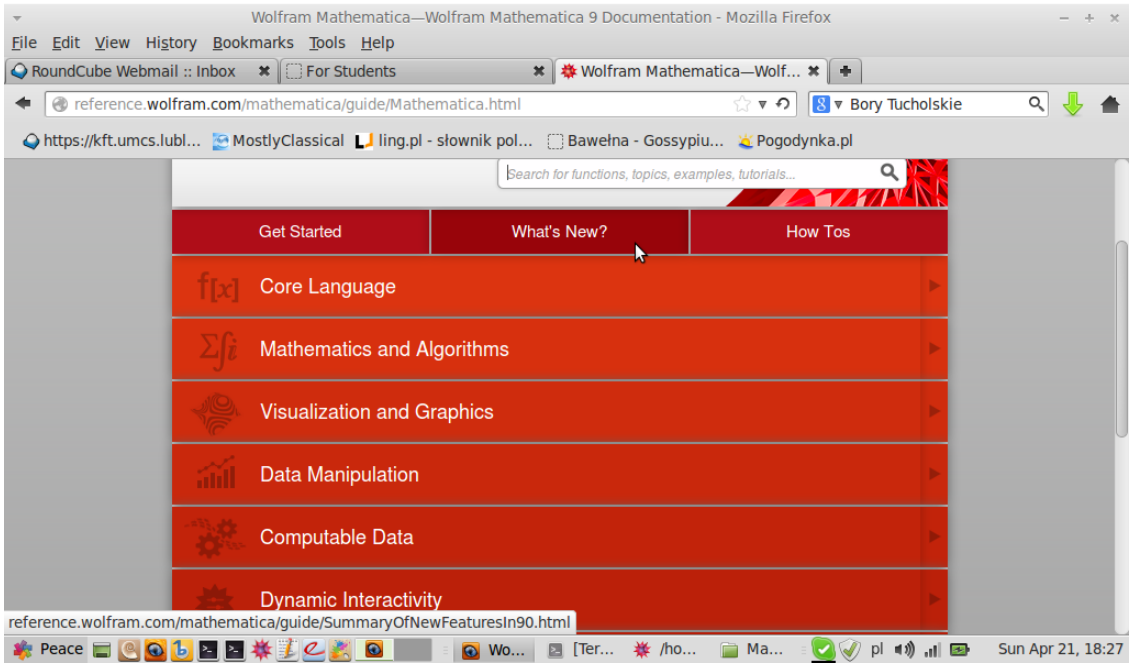
Out[4]=



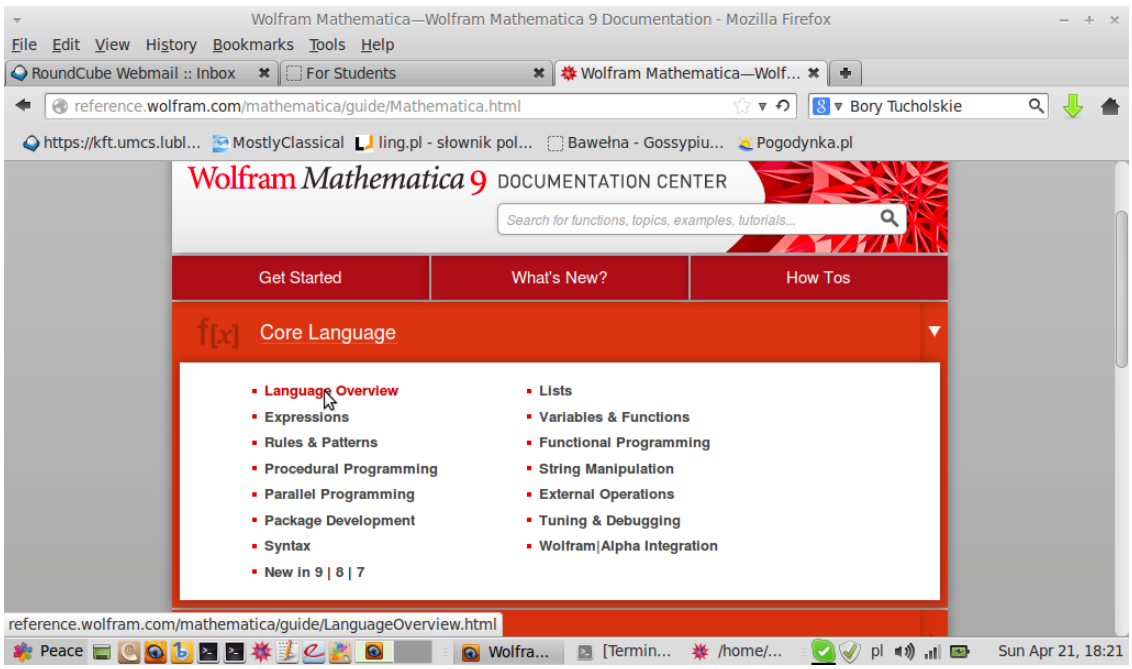

```
Import["/home/marek/Documents/praca/studenci/MathematicaOverview/MojaStrona.png"]
```



```
Import["/home/marek/Documents/praca/studenci/MathematicaOverview/WolframGuide1.png"]
```




```
Import["/home/marek/Documents/praca/studenci/MathematicaOverview/WolframGuide2.png"]
```



Proste operacje

a

a

```
a = 1
a
```

```
1
```

```
1
```

```
N[Pi]
```

```
3.14159
```

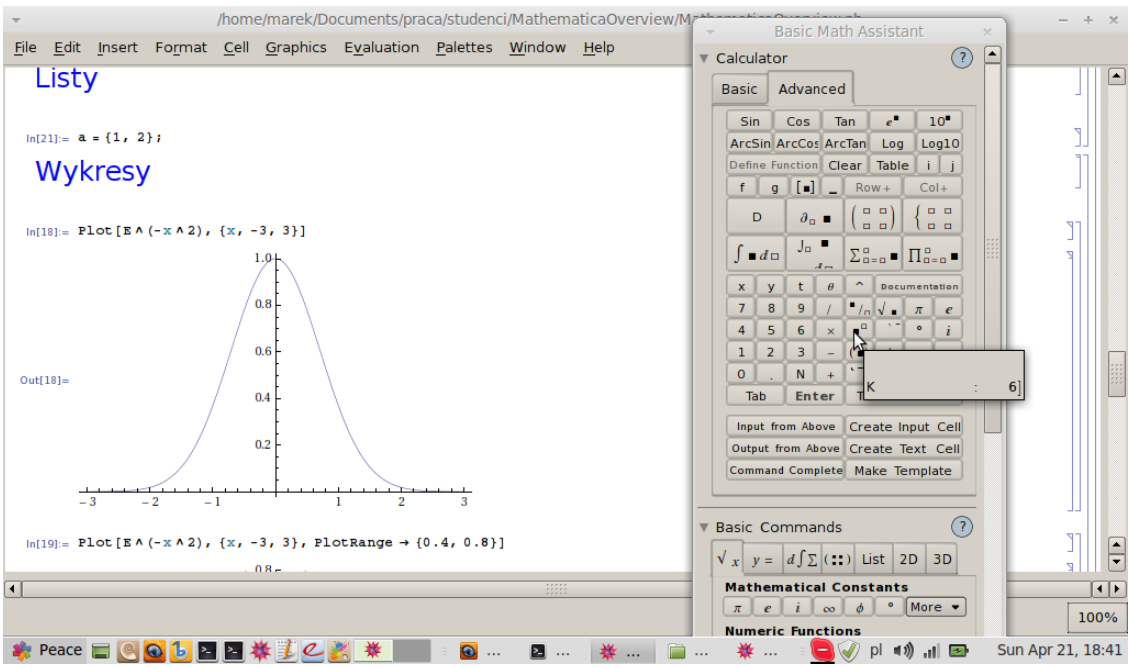
```
N[Pi, 200]
```

```
3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862803482534211706798214808651328230664709384460955058223172535940812848111745028410270193852110555964462294895493038 20
```

```
Simplify[(2 * x^2 - 2) / 2]
```

$$-1 + x^2$$

```
Import["/home/marek/Documents/praca/studenci/MathematicaOverview/Palety.png"]
```




```
Expand[(x^2 + 1)^3]
```

$$1 + 3\,x^2 + 3\,x^4 + x^6$$

```
TrigFactor[Cos[α + β]]
```

$$\text{Cos}[\alpha + \beta]$$

```
Solve[x^3 - 2 * x^2 - 1 == 0, x]
```

$$\left\{\left\{x \to \frac{2}{3}+\frac{1}{3}\left(\frac{43}{2}-\frac{3\sqrt{177}}{2}\right)^{1/3}+\frac{1}{3}\left(\frac{1}{2}\left(43+3\sqrt{177}\right)\right)^{1/3}\right\},\right.$$

$$\left\{x \to \frac{2}{3}-\frac{1}{6}\left(1+i\sqrt{3}\right)\left(\frac{43}{2}-\frac{3\sqrt{177}}{2}\right)^{1/3}-\frac{1}{6}\left(1-i\sqrt{3}\right)\left(\frac{1}{2}\left(43+3\sqrt{177}\right)\right)^{1/3}\right\},$$

$$\left.\left\{x \to \frac{2}{3}-\frac{1}{6}\left(1-i\sqrt{3}\right)\left(\frac{43}{2}-\frac{3\sqrt{177}}{2}\right)^{1/3}-\frac{1}{6}\left(1+i\sqrt{3}\right)\left(\frac{1}{2}\left(43+3\sqrt{177}\right)\right)^{1/3}\right\}\right\}$$

```
Limit[1 / x, x → -Infinity]
```

```
0
```

```
Sum[(1 / 3)^n, {n, 1, Infinity}]
```

$$\frac{1}{2}$$

```
Sum[i^2, {i, 0, n}]
```

$$\frac{1}{6}n\,(1+n)\,(1+2n)$$

```
funkcja = Sin[x^2 + 2] * y^2 - Log[x * y];
TraditionalForm[funkcja]
D[funkcja, x]
```

$$y^2 \sin\left(x^2+2\right)-\log(x\,y)$$

$$-\frac{1}{x}+2\,x\,y^2\,\text{Cos}\left[2+x^2\right]$$

```
D[funkcja, {x, 3}]
D[funkcja, x, y, x]
```

$$-\frac{2}{x^3}+y^2\left(-8\,x^3\,\text{Cos}\left[2+x^2\right]-12\,x\,\text{Sin}\left[2+x^2\right]\right)$$

$$4\,y\,\text{Cos}\left[2+x^2\right]-8\,x^2\,y\,\text{Sin}\left[2+x^2\right]$$

```
Integrate[x * E^(-x^2 - x), x]
Integrate[x * E^(-x^2 - x), {x, -3, 1}]
NIntegrate[x * E^(-x^2 - x), {x, -3, 1}]
Integrate[x * E^(-x^2 - x), {x, -Infinity, Infinity}]
```

$$-\frac{1}{2}\,e^{-x\,(1+x)}-\frac{1}{4}\,e^{1/4}\,\sqrt{\pi}\,\text{Erf}\left[\frac{1}{2}+x\right]$$

$$-\frac{-2+2\,e^4+e^{25/4}\,\sqrt{\pi}\,\left(\text{Erf}\left[\frac{3}{2}\right]+\text{Erf}\left[\frac{5}{2}\right]\right)}{4\,e^6}$$

```
-1.18485
```

$$-\frac{1}{2}\,e^{1/4}\,\sqrt{\pi}$$

```
DSolve[y''[x] == y[x] + 1, y[x], x]
```

```
{{y[x] → -1 + ℯ^x C[1] + ℯ^-x C[2]}}
```

```
DSolve[{y''[x] == y[x] + 1, y[0] == 1, y'[0] == 2}, y[x], x]
```

```
{{y[x] → -1 + 2 ℯ^x}}
```

```
TraditionalForm[D[f[x, t], x] == -2 * D[f[x, t], t]]
DSolve[D[f[x, t], x] == -2 * D[f[x, t], t], f[x, t], {x, t}]
```

$$f^{(1,0)}(x, t) = -2 f^{(0,1)}(x, t)$$

```
{{f[x, t] → C[1][t - 2 x]}}
```

Listy

```
a = {1, 2};

Append[a, 50]
```

```
{1, 2, 50}
```

```
b = {2, 40, 100};
NowaLista1 = Join[a, b]
NowaLista2 = Union[a, b]
```

```
{1, 2, 2, 40, 100}
```

```
{1, 2, 40, 100}
```

```
Length[b]
```

```
3
```

```
Position[NowaLista1, 2]
```

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

```
Clear[a, b]

Map[f, {a, b}]
```

```
{f[a], f[b]}
```

```
macierz1 = {{1, 2}, {3, 4}};
MatrixForm[%]
```

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

```
macierz2 = Table[i + j, {j, 2}, {i, 3}]
```

```
{{2, 3, 4}, {3, 4, 5}}
```

```
MatrixForm[%]
```

$$\begin{pmatrix} 2 & 3 & 4 \\ 3 & 4 & 5 \end{pmatrix}$$

```
MatrixForm[Table[i + j, {i, 3}, {j, 2}]]
```

$$\begin{pmatrix} 2 & 3 \\ 3 & 4 \\ 4 & 5 \end{pmatrix}$$

```
macierz3 = Table[i, {i, 2}, {j, 2}]
```

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

```
macierz1 + macierz3
macierz1.macierz3
```

```
{{2, 3}, {5, 6}}
```

```
{{5, 5}, {11, 11}}
```

```
MatrixForm[macierz2]
```

$$\begin{pmatrix} 2 & 3 \\ 3 & 4 \\ 4 & 5 \end{pmatrix}$$

```
(* inaczej Part[] *)
macierz2[[2]][[1]]
```

```
3
```

Reguly i wzorce, funkcje

```
Sin[x] /. {x → 3}
```

```
Sin[3]
```

```
x
```

```
x
```

```
x = 3;
x
```

```
3
```

```
Clear[x]
```

```
fun[x_] := x^2 + Sin[x]
```

```
fun[y]
fun[3]
```

$$y^2 + \text{Sin}[y]$$

$$9 + \text{Sin}[3]$$

```
x
```

```
x
```

```
f[abc_] := Module[{x = abc}, out = Sin[x]; out]
f[1 / 2]
```

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

Rekurencje

```
Do[Print[i, " Ala ma kota"], {i, 0, 3}]
```

```
0 Ala ma kota

1 Ala ma kota

2 Ala ma kota

3 Ala ma kota
```

```
przyklad1[x_] := If[x > 0, Print["Tak"], Print["Nie"]]
przyklad1[1.1]
```

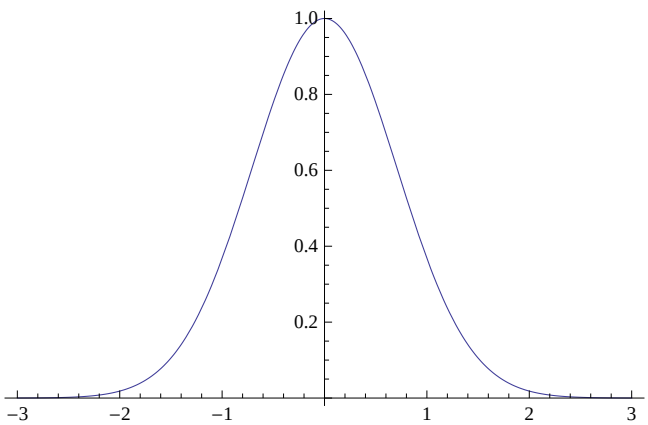
```
Tak
```

In[1]:=
```
For[i = 1, i < 5, i++, Print[i]]
```

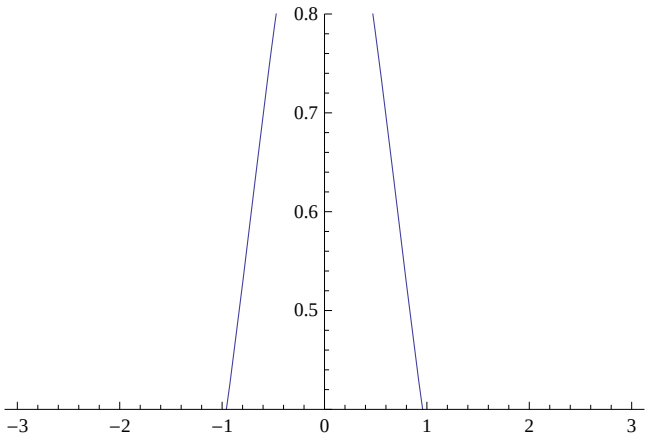
```
1

2

3

4
```

Wykresy

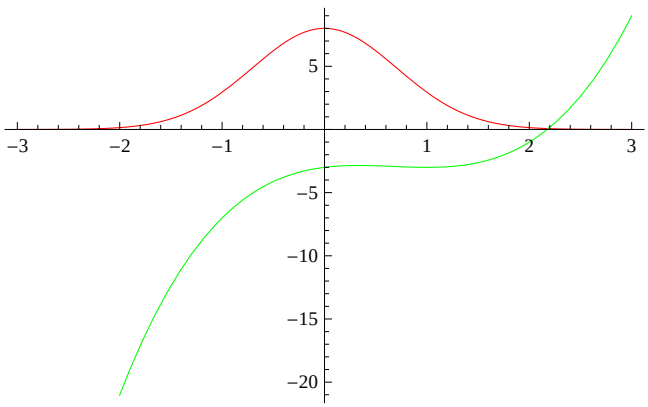
```
Plot[E^(-x^2), {x, -3, 3}]
```



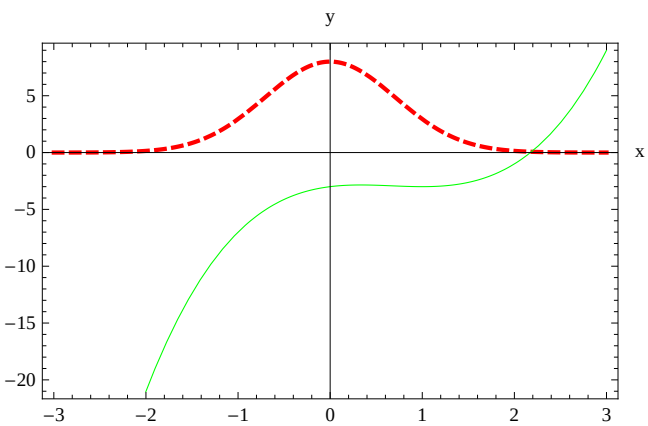
```
Plot[E^(-x^2), {x, -3, 3}, PlotRange → {0.4, 0.8}]
```




```
Plot[{8 * E^(-x^2), x^3 - 2 * x^2 + x - 3}, {x, -3, 3}, PlotStyle -> {Red, Green}]
```



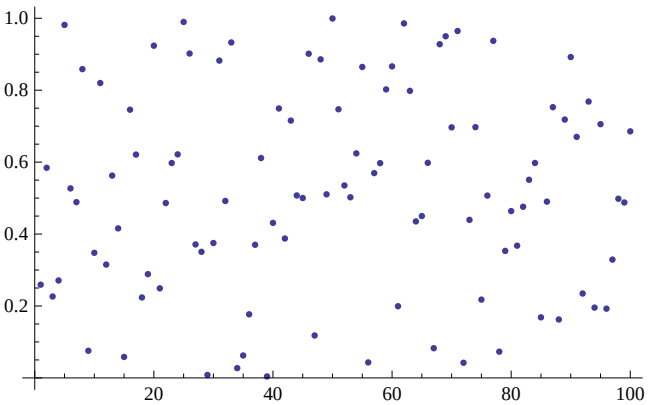

```
Plot[{8 * E^(-x^2), x^3 - 2 * x^2 + x - 3}, {x, -3, 3},
 PlotStyle -> {{Red, Thick, Dashed}, Green}, Frame → True, AxesLabel → {"x", "y"}]
```



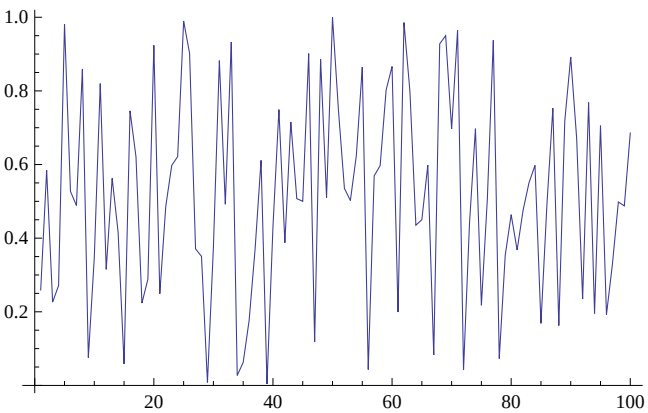
```
lista = Table[{i, Random[]}, {i, 100}]
```

```
{{1, 0.259319}, {2, 0.584314}, {3, 0.226401}, {4, 0.270956}, {5, 0.981543}, {6, 0.526948},
 {7, 0.48881}, {8, 0.858567}, {9, 0.0754608}, {10, 0.347852}, {11, 0.819917}, {12, 0.315194},
 {13, 0.562546}, {14, 0.415788}, {15, 0.0583075}, {16, 0.745769}, {17, 0.620956},
 {18, 0.223735}, {19, 0.28856}, {20, 0.923768}, {21, 0.249058}, {22, 0.486314},
 {23, 0.59751}, {24, 0.621568}, {25, 0.989738}, {26, 0.902}, {27, 0.371108}, {28, 0.350612},
 {29, 0.00819579}, {30, 0.375052}, {31, 0.882298}, {32, 0.492045}, {33, 0.932735},
 {34, 0.0271994}, {35, 0.0623817}, {36, 0.176851}, {37, 0.370189}, {38, 0.611411},
 {39, 0.00407428}, {40, 0.431082}, {41, 0.749233}, {42, 0.387676}, {43, 0.715514},
 {44, 0.507313}, {45, 0.500175}, {46, 0.901362}, {47, 0.118005}, {48, 0.885746},
 {49, 0.510437}, {50, 0.999362}, {51, 0.746896}, {52, 0.535133}, {53, 0.502241}, {54, 0.62431},
 {55, 0.864598}, {56, 0.0430887}, {57, 0.569506}, {58, 0.597111}, {59, 0.802216},
 {60, 0.866238}, {61, 0.199317}, {62, 0.985699}, {63, 0.798142}, {64, 0.435156},
 {65, 0.450084}, {66, 0.598023}, {67, 0.0826276}, {68, 0.927843}, {69, 0.949909},
 {70, 0.696661}, {71, 0.964623}, {72, 0.0420972}, {73, 0.439473}, {74, 0.697299},
 {75, 0.217726}, {76, 0.506964}, {77, 0.937232}, {78, 0.0729893}, {79, 0.353128},
 {80, 0.463875}, {81, 0.367726}, {82, 0.475879}, {83, 0.550912}, {84, 0.597637},
 {85, 0.168409}, {86, 0.490179}, {87, 0.75277}, {88, 0.162481}, {89, 0.718325}, {90, 0.892156},
 {91, 0.670142}, {92, 0.234638}, {93, 0.768416}, {94, 0.195495}, {95, 0.705519},
 {96, 0.192541}, {97, 0.328943}, {98, 0.498195}, {99, 0.487793}, {100, 0.685577}}
```

```
ListPlot[lista]
```

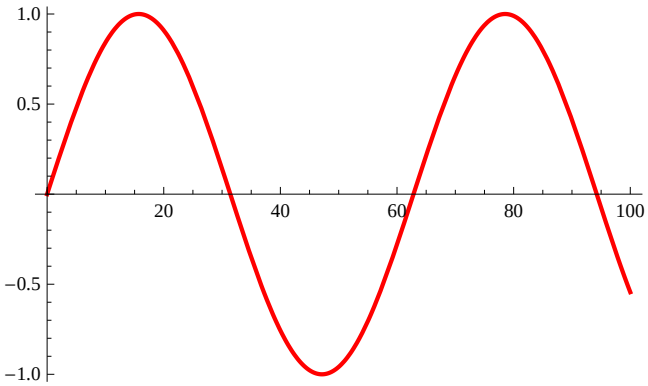



```
AlaMaKota1 = ListPlot[lista, PlotJoined → True]
```

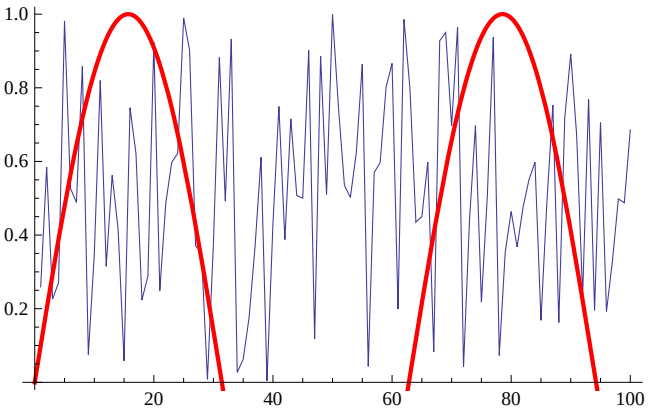



```
Plot3D[E^(-(x^2 + 2 * (y^2 / 3 - Sin[4 * y]) / 3)), {x, -3, 3}, {y, -3, 3}, PlotRange → {0, 2}]
```

```
AlaMaKota2 = Plot[Sin[1 / 10 * x], {x, 0, 100}, PlotStyle → {Red, Thick}]
```




```
Show[{AlaMaKota1, AlaMaKota2}]
```



In[5]:=
```
Import["/home/marek/Documents/praca/studenci/MathematicaOverview/Manipulate.png"]
```

Out[5]=