```
In[1]:= << Calculus`Integration`

In[2]:= Off[NIntegrate::ploss, NIntegrate::"ncvb", NIntegrate::"slwcon"]

In[3]:= kmax = 10;

In[4]:= f[1][x_] = Sin[Pi * x];
        f[2][x_] = (2 * x - 1) * Sin[Pi * x]^4;
        f[3][x_] = 16 * (2 * x - 1) * Exp[-4 * (2 * x - 1)^2];
        f[4][x_] = Exp[-16 * (x - 0.5)^2];
        f[5][x_] = 16 * Abs[2 * x - 1] * Exp[-4 * (2 * x - 1)^2];
        f[6][x_] = 1 / (1 + 64 * (x - 0.5)^2);
        f[7][x_] = 8 * (x - 0.5) / (1 + 64 * (x - 0.5)^2);
        f[8][x_] = 2 * (x - 0.5);
        f[9][x_] = 4 * (2 * x - 1) / (1 + 16 * (2 * x - 1)^2);
        f[10][x_] = -Cos[Pi * x];
        f[11][x_] = If[x < 1 / 6 || x > 5 / 6, 0, Sin[3 * Pi * (x - 1 / 6)]];
        f[12][x_] = If[x < 1 / 2, 2 * x, 2 * (x - 1)];
        f[13][x_] = If[x < 1 / 6 || x > 5 / 6, 0, 1];
        f[14][x_] = Which[x < 1 / 3, 1.5 * x, x < 2 / 3, 1, x < 1, 1.5 * (1 - x)];
        f[15][x_] = If[x < 1 / 4 || x > 3 / 4, Sin[4 * Pi * x], 0];
        f[16][x_] = Which[x < 1 / 3, 3 * x, x < 2 / 3, 0, x < 1, 3 * (x - 1)];
        f[17][x_] =
          If[Abs[x - 0.5] < 10^(-20), 1, Abs[Sin[3 * Pi * (2 * x - 1)] / (3 * Pi * (2 * x - 1))]];
        f[18][x_] = Sin[2 * Pi * (2 * x - 1)^2];
        f[19][x_] = Which[x < 1 / 4, 0, x < 1 / 2, -1, x < 3 / 4, 1, x < 1, 0];
        f[20][x_] = If[Abs[x - 0.5] < 10^(-20), 1, Sin[6 * Pi * (x - 0.5)] / (6 * Pi * (x - 0.5))];
        f[21][x_] = Which[x < 1 / 4, x, x < 3 / 4, 2 * (1 / 2 - x), x < 1, 1 - x];
        f[22][x_] = If[x < 1 / 2, 2 * x, 2 * (1 - x)];

In[31]:= Do[
          Print["funkcja nr ", i];
         a0 = 2 * NIntegrate[f[i][x], {x, 0, 1}] // Chop;
          Print["a[0]=", a0];
         a = Table[2 * NIntegrate[f[i][x] * Cos[2 * Pi * k * x], {x, 0, 1}], {k, 1, kmax}] // Chop;
          Do[Print["a[", j, "]=", a[[j]]], {j, 1, kmax}];
         b = Table[2 * NIntegrate[f[i][x] * Sin[2 * Pi * k * x], {x, 0, 1}], {k, 1, kmax}] // Chop;
          Do[Print["b[", j, "]=", b[[j]]], {j, 1, kmax}];
         cosines = Table[Cos[2 * Pi * k * x], {k, 1, kmax}];
         sines = Table[Sin[2 * Pi * k * x], {k, 1, kmax}];
         f1[x_] = a0 / 2 + a.cosines + b.sines;
         data = Table[{x, f1[x]}, {x, 0, 1, 0.01}];
         rys1 = ListPlot[data, PlotStyle → PointSize[0.011], DisplayFunction → Identity];
         rys2 = Plot[f[i][x], {x, 0, 1},
            PlotStyle → RGBColor[1, 0, 0], DisplayFunction → Identity];
         Show[rys1, rys2, Frame → True, Axes → None,
           DisplayFunction → $DisplayFunction, PlotRange → All];
          Print["\n\n\n"];
          , {i, 1, 22}]

        funkcja nr 1

        a[0]=1.27324

        a[1]=-0.424413

        a[2]=-0.0848826
```

a[3]=-0.0363783

a[4]=-0.0202102

a[5]=-0.012861

a[6]=-0.00890377

a[7]=-0.00652943

a[8]=-0.0049931

a[9]=-0.00394192

a[10]=-0.00319108

b[1]=0

b[2]=0

b[3]=0

b[4]=0

b[5]=0

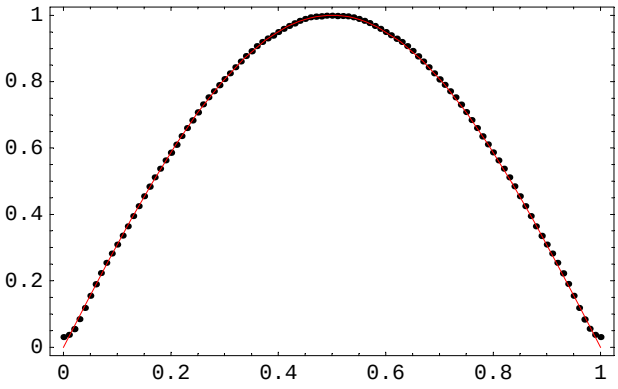
b[6]=0

b[7]=0

b[8]=0

b[9]=0

b[10]=0



funkcja nr 2

a[0]=0

a[1]=0

a[2]=0

a[3]=0

a[4]=0

a[5]=0

a[6]=0

a[7]=0

a[8]=0

a[9]=0

a[10]=0

b[1]=-0.132629

b[2]=0.0828932

b[3]=-0.00795775

b[4]=-0.00132629

b[5]=-0.00037894

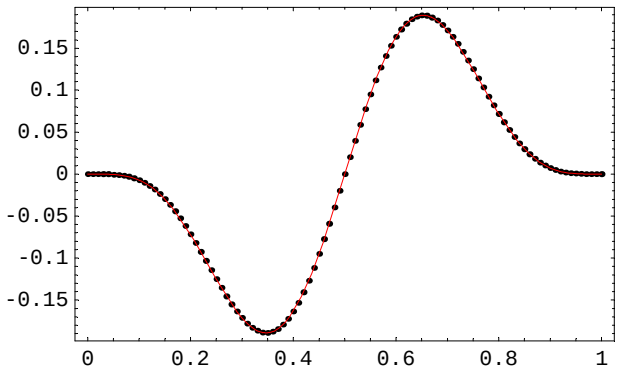
b[6]=-0.000142103

b[7]=-0.0000631567

b[8]=-0.0000315784

b[9]=-0.0000172246

b[10]=-0.0000100477



funkcja nr 3

a[0]=0

a[1]=0

a[2]=0

a[3]=0

a[4]=0

a[5]=0

a[6]=0

a[7]=0

a[8]=0

a[9]=0

a[10]=0

b[1]=-3.02852

b[2]=0.908099

b[3]=-0.103217

b[4]=-0.0342785

b[5]=-0.031379

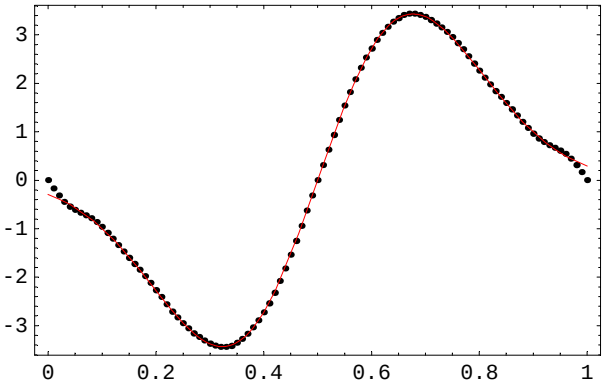
b[6]=-0.0276173

b[7]=-0.0244531

b[8]=-0.0218447

b[9]=-0.019692

b[10]=-0.0178998



funkcja nr 4

a[0]=0.882081

a[1]=-0.482003

a[2]=0.0722642

a[3]=-0.00547583

a[4]=-0.0013639

a[5]=-0.000998823

a[6]=-0.000732571

a[7]=-0.000555976

a[8]=-0.000434587

a[9]=-0.00034823

a[10]=-0.000284885

b[1]=0

b[2]=0

b[3]=0

b[4]=0

b[5]=0

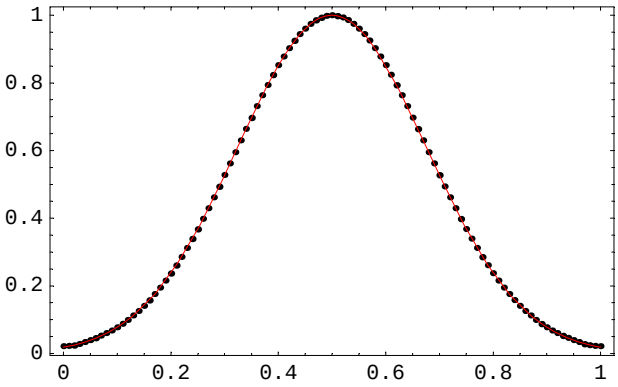
b[6]=0

b[7]=0

b[8]=0

b[9]=0

b[10]=0



funkcja nr 5

a[0]=3.92674

a[1]=−0.73664

a[2]=−1.17737

a[3]=0.512714

a[4]=−0.268769

a[5]=0.130111

a[6]=−0.107729

a[7]=0.0616921

a[8]=−0.0589764

a[9]=0.0363095

a[10]=−0.0373066

b[1]=0

b[2]=0

b[3]=0

b[4]=0

b[5]=0

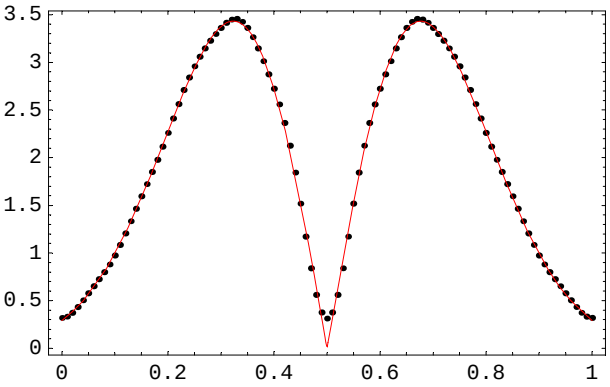
b[6]=0

b[7]=0

b[8]=0

b[9]=0

b[10]=0



funkcja nr 6

a[0]=0.662909

a[1]=-0.371646

a[2]=0.158623

a[3]=-0.0767052

a[4]=0.0326159

a[5]=-0.0163388

a[6]=0.00644866

a[7]=-0.00366574

a[8]=0.00112144

a[9]=-0.000942369

a[10]=0.0000827306

b[1]=0

b[2]=0

b[3]=0

b[4]=0

b[5]=0

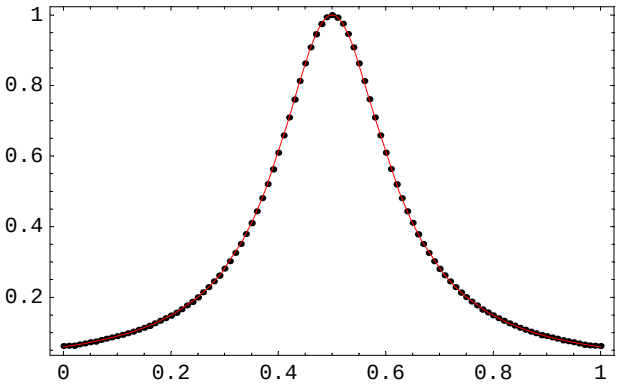
b[6]=0

b[7]=0

b[8]=0

b[9]=0

b[10]=0



funkcja nr 7

a[0]=0

a[1]=0

a[2]=0

a[3]=0

a[4]=0

a[5]=0

a[6]=0

a[7]=0

a[8]=0

a[9]=0

a[10]=0

b[1]=-0.49314

b[2]=0.0907737

b[3]=-0.123609

b[4]=-0.00317809

b[5]=-0.0452621

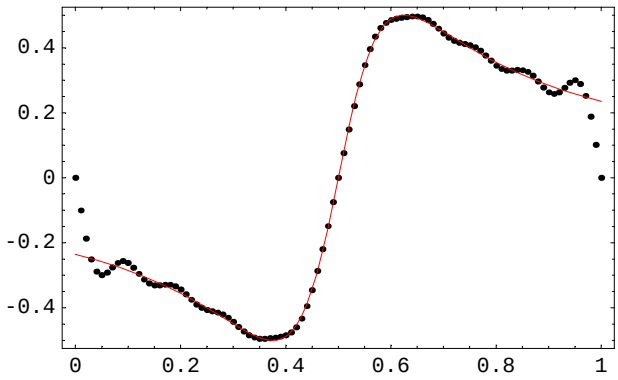
b[6]=-0.0178104

b[7]=-0.0245528

b[8]=-0.0172151

b[9]=-0.0172826

b[10]=-0.0146527



funkcja nr 8

a[0]=0

a[1]=0

a[2]=0

a[3]=0

a[4]=0

a[5]=0

a[6]=0

a[7]=0

a[8]=0

a[9]=0

a[10]=0

b[1]=-0.63662

b[2]=-0.31831

b[3]=-0.212207

b[4]=-0.159155

b[5]=-0.127324

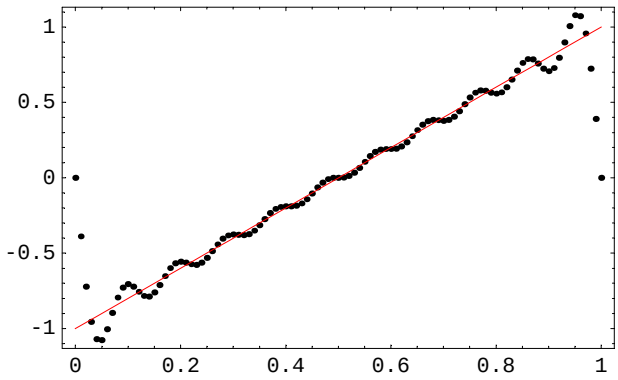
b[6]=-0.106103

b[7]=-0.0909457

b[8]=-0.0795775

b[9]=-0.0707355

b[10]=-0.063662



funkcja nr 9

a[0]=0

a[1]=0

a[2]=0

a[3]=0

a[4]=0

a[5]=0

a[6]=0

a[7]=0

a[8]=0

a[9]=0

a[10]=0

b[1]=-0.49314

b[2]=0.0907737

b[3]=-0.123609

b[4]=-0.00317809

b[5]=-0.0452621

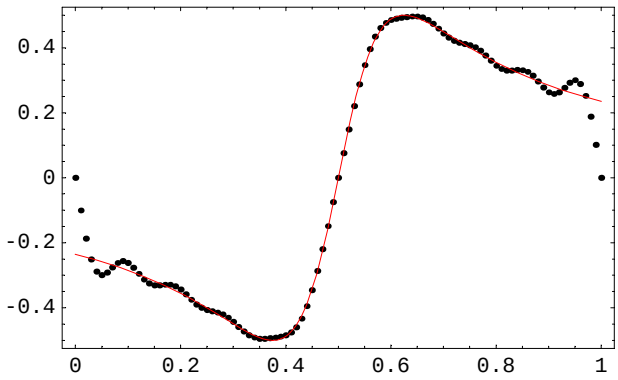
b[6]=-0.0178104

b[7]=-0.0245528

b[8]=-0.0172151

b[9]=-0.0172826

b[10]=-0.0146527



funkcja nr 10

a[0]=0

a[1]=0

a[2]=0

a[3]=0

a[4]=0

a[5]=0

a[6]=0

a[7]=0

a[8]=0

a[9]=0

a[10]=0

b[1]=-0.848826

b[2]=-0.339531

b[3]=-0.21827

b[4]=-0.161681

b[5]=-0.12861

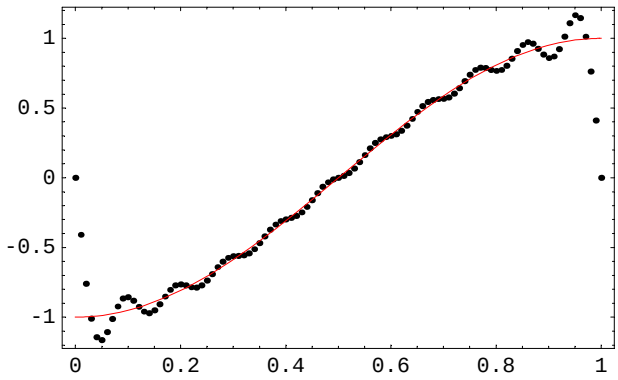
b[6]=-0.106845

b[7]=-0.0914121

b[8]=-0.0798895

b[9]=-0.0709545

b[10]=-0.0638215



funkcja nr 11

a[0]=0

a[1]=0

a[2]=0

a[3]=0

a[4]=0

a[5]=0

a[6]=0

a[7]=0

a[8]=0

a[9]=0

a[10]=0

b[1]=0.661595

b[2]=-0.472568

b[3]=0

b[4]=0.060145

b[5]=0.0363514

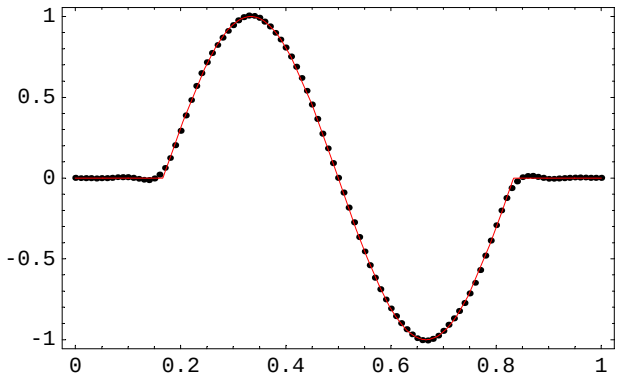
b[6]=0

b[7]=-0.0176897

b[8]=-0.0133926

b[9]=0

b[10]=0.00846029



funkcja nr 12

a[0]=0

a[1]=0

a[2]=0

a[3]=0

a[4]=0

a[5]=0

a[6]=0

a[7]=0

a[8]=0

a[9]=0

a[10]=0

b[1]=0.63662

b[2]=-0.31831

b[3]=0.212207

b[4]=-0.159155

b[5]=0.127324

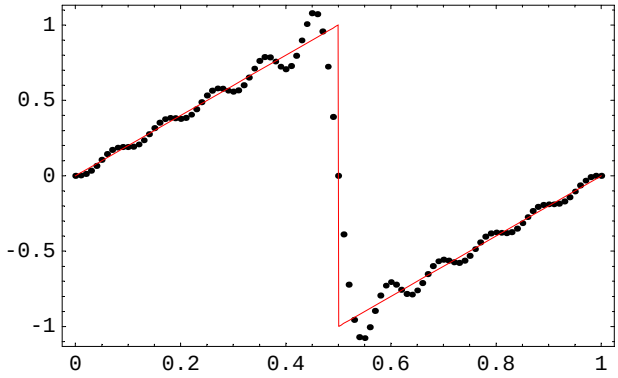
b[6]=-0.106103

b[7]=0.0909457

b[8]=-0.0795775

b[9]=0.0707355

b[10]=-0.063662



funkcja nr 13

a[0]=1.33333

a[1]=-0.551329

a[2]=-0.275664

a[3]=0

a[4]=0.137832

a[5]=0.110266

a[6]=0

a[7]=-0.0787613

a[8]=-0.0689161

a[9]=0

a[10]=0.0551329

b[1]=0

b[2]=0

b[3]=0

b[4]=0

b[5]=0

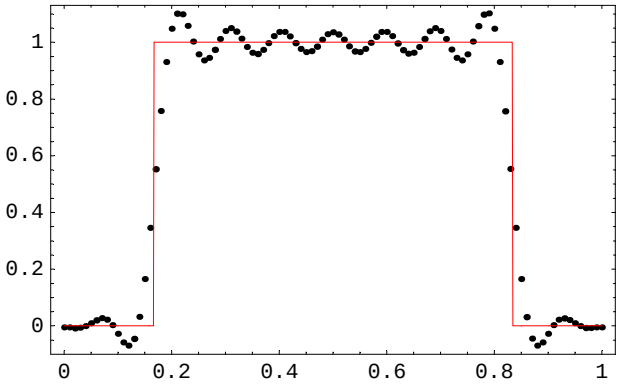
b[6]=0

b[7]=0

b[8]=0

b[9]=0

b[10]=0




```
funkcja nr 14

a[0]=1.

a[1]=-0.503637

a[2]=0.0808391

a[3]=0

a[4]=-0.0831644

a[5]=0.046014

a[6]=0

a[7]=-0.0440331

a[8]=0.030896

a[9]=0

a[10]=-0.0298462

b[1]=0

b[2]=0

b[3]=0

b[4]=0

b[5]=0

b[6]=0

b[7]=0

b[8]=0

b[9]=0

b[10]=0
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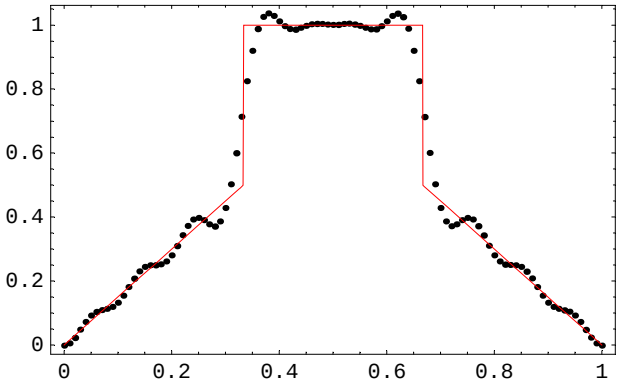


funkcja nr 15

a[0]=0

a[1]=0

a[2]=0

a[3]=0

a[4]=0

a[5]=0

a[6]=0

a[7]=0

a[8]=0

a[9]=0

a[10]=0

b[1]=0.424413

b[2]=0.5

b[3]=0.254648

b[4]=0

b[5]=-0.0606305

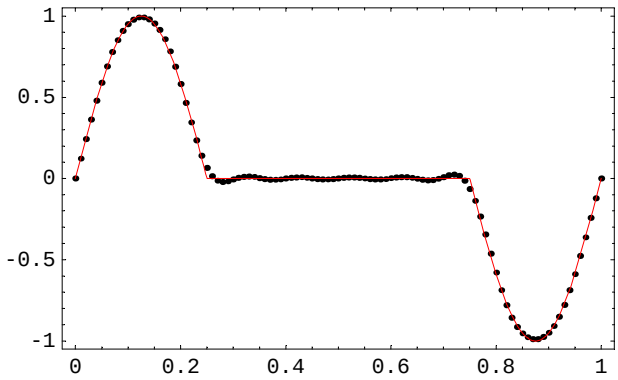
b[6]=0

b[7]=0.0282942

b[8]=0

b[9]=-0.0165356

b[10]=0



funkcja nr 16

a[0]=0

a[1]=0

a[2]=0

a[3]=0

a[4]=0

a[5]=0

a[6]=0

a[7]=0

a[8]=0

a[9]=0

a[10]=0

b[1]=0.58155

b[2]=0.0933449

b[3]=-0.212207

b[4]=0.09603

b[5]=0.0531324

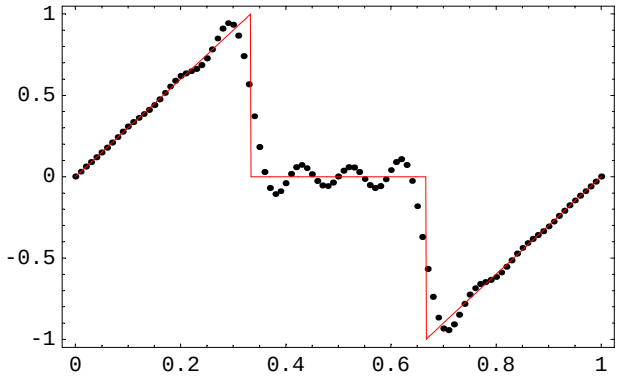
b[6]=-0.106103

b[7]=0.0508451

b[8]=0.0356756

b[9]=-0.0707355

b[10]=0.0344634



funkcja nr 17

a[0]=0.5395

a[1]=-0.314922

a[2]=0.204649

a[3]=-0.145363

a[4]=0.0917435

a[5]=-0.0307367

a[6]=-0.0660813

a[7]=0.009993

a[8]=0.00864224

a[9]=-0.0102234

a[10]=0.0089574

b[1]=0

b[2]=0

b[3]=0

b[4]=0

b[5]=0

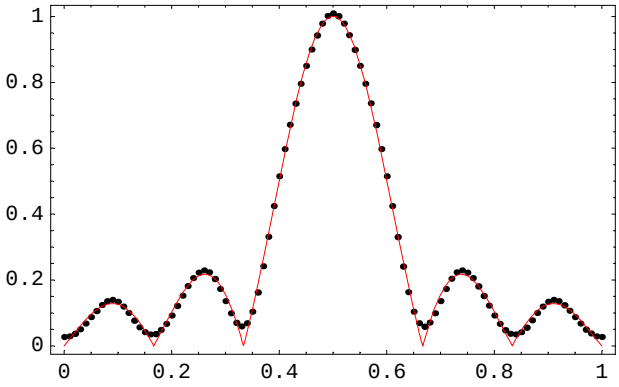
b[6]=0

b[7]=0

b[8]=0

b[9]=0

b[10]=0



funkcja nr 18

a[0]=0.343416

a[1]=-0.435511

a[2]=-0.692807

a[3]=0.0256127

a[4]=0.210258

a[5]=0.164261

a[6]=0.108131

a[7]=0.0727815

a[8]=0.0517725

a[9]=0.0387222

a[10]=0.0301268

b[1]=0

b[2]=0

b[3]=0

b[4]=0

b[5]=0

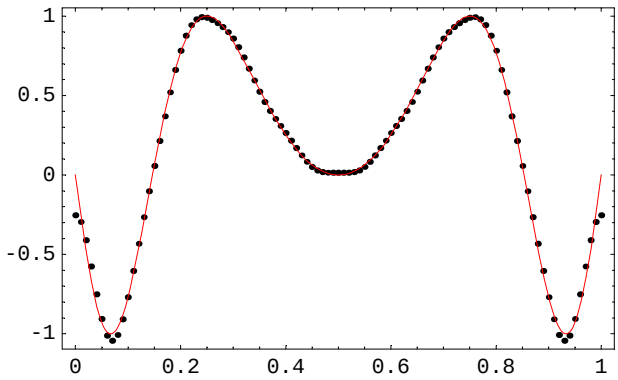
b[6]=0

b[7]=0

b[8]=0

b[9]=0

b[10]=0



funkcja nr 19

a[0]=0

a[1]=0

a[2]=0

a[3]=0

a[4]=0

a[5]=0

a[6]=0

a[7]=0

a[8]=0

a[9]=0

a[10]=0

b[1]=-0.63662

b[2]=0.63662

b[3]=-0.212207

b[4]=0

b[5]=-0.127324

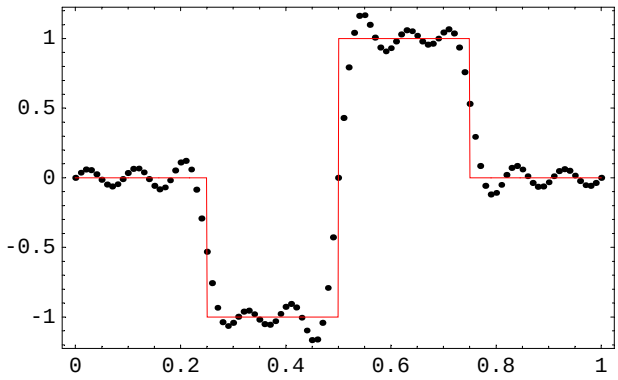
b[6]=0.212207

b[7]=-0.0909457

b[8]=0

b[9]=-0.0707355

b[10]=0.127324



funkcja nr 20

a[0]=0.355395

a[1]=-0.308794

a[2]=0.369866

a[3]=-0.161068

a[4]=-0.0250246

a[5]=-0.0119875

a[6]=-0.00728769

a[7]=-0.00497283

a[8]=-0.00363714

a[9]=-0.00278771

a[10]=-0.00221045

b[1]=0

b[2]=0

b[3]=0

b[4]=0

b[5]=0

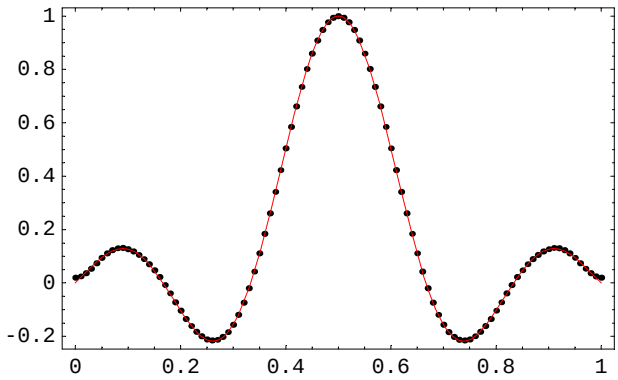
b[6]=0

b[7]=0

b[8]=0

b[9]=0

b[10]=0



funkcja nr 21

a[0]=0.125

a[1]=0.0578338

a[2]=-0.0506606

a[3]=-0.0643096

a[4]=0

a[5]=0.0277781

a[6]=-0.00562895

a[7]=-0.0248042

a[8]=0

a[9]=0.016433

a[10]=-0.00202642

b[1]=0.202642

b[2]=-0.159155

b[3]=-0.0225158

b[4]=0.0795775

b[5]=0.00810569

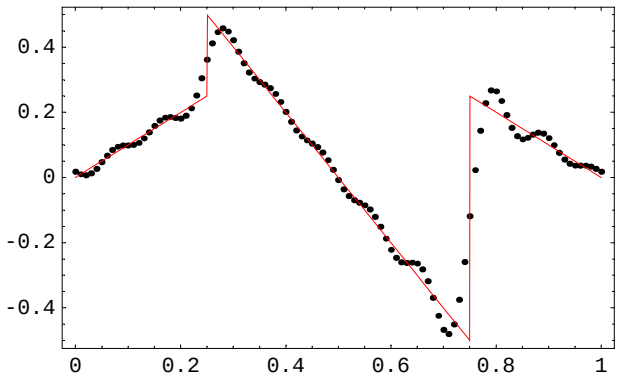
b[6]=-0.0530516

b[7]=-0.00413556

b[8]=0.0397887

b[9]=0.00250176

b[10]=-0.031831



funkcja nr 22

a[0]=1.

a[1]=-0.405285

a[2]=0

a[3]=-0.0450316

a[4]=0

a[5]=-0.0162114

a[6]=0

a[7]=-0.00827112

a[8]=0

a[9]=-0.00500352

a[10]=0

b[1]=0

b[2]=0

b[3]=0

b[4]=0

b[5]=0

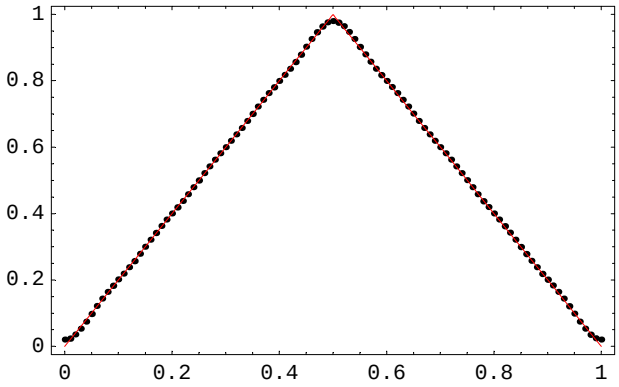
b[6]=0

b[7]=0

b[8]=0

b[9]=0

b[10]=0


1
0.8
0.6
0.4
0.2
0
0
0.2
0.4
0.6
0.8
1