setup

overhead

tag

In[383]:=
```
home = "ert/stc/algorithms/";
Get["utility modules.m", Path → dirPack];
stamp1;
```

```
maximum memory: 0.210887 GB
seed file: /Users/dantopa/Mathematica_files/nb/seed 19_12.nb
user: dantopa, CPU: Xiuhcoatl,  MM v. 12.0.0 for Mac OS X x86
date: Mar 30, 2020, time: 16:16:46
nb: /Users/dantopa/Mathematica_files/nb/ert/stc/algorithms/log-01.nb
```

modules, functions, settings, ...

2 spreadsheet

In[417]:=
```
(* column A *)
x = Range[0, 600, 15]
```

Out[417]=
```
{0, 15, 30, 45, 60, 75, 90, 105, 120, 135, 150, 165, 180, 195,
 210, 225, 240, 255, 270, 285, 300, 315, 330, 345, 360, 375, 390,
 405, 420, 435, 450, 465, 480, 495, 510, 525, 540, 555, 570, 585, 600}
```

In[411]:=
```
(* column B *)
n = 10^14 Exp[-x^2/5000];
% // N
```

Out[412]=
$$\{1.\times 10^{14}, 9.55997\times 10^{13}, 8.3527\times 10^{13}, 6.66977\times 10^{13}, 4.86752\times 10^{13}, 3.24652\times 10^{13},$$
$$1.97899\times 10^{13}, 1.10251\times 10^{13}, 5.61348\times 10^{12}, 2.61214\times 10^{12}, 1.1109\times 10^{12},$$
$$4.31784\times 10^{11}, 1.53381\times 10^{11}, 4.97955\times 10^{10}, 1.47748\times 10^{10}, 4.00653\times 10^{9},$$
$$9.9295\times 10^{8}, 2.24906\times 10^{8}, 4.65572\times 10^{7}, 8.80818\times 10^{6}, 1.523\times 10^{6}, 240\,672., 34\,758.9,$$
$$4587.96, 553.461, 61.0194, 6.1484, 0.5662, 0.047653, 0.00366543, 0.000257676,$$
$$0.0000165552, 9.72099\times 10^{-7}, 5.21674\times 10^{-8}, 2.55859\times 10^{-9}, 1.14688\times 10^{-10},$$
$$4.69835\times 10^{-12}, 1.75909\times 10^{-13}, 6.01928\times 10^{-15}, 1.88241\times 10^{-16}, 5.38019\times 10^{-18}\}$$

In[409]:=
```
(* column c *)
nx = -2 x n/5000;
% // N
```

Out[410]=
$$\{0., -5.73598\times 10^{11}, -1.00232\times 10^{12}, -1.20056\times 10^{12}, -1.16821\times 10^{12},$$
$$-9.73957\times 10^{11}, -7.12435\times 10^{11}, -4.63052\times 10^{11}, -2.69447\times 10^{11}, -1.41056\times 10^{11},$$
$$-6.6654\times 10^{10}, -2.84977\times 10^{10}, -1.10434\times 10^{10}, -3.88405\times 10^{9}, -1.24109\times 10^{9},$$
$$-3.60588\times 10^{8}, -9.53232\times 10^{7}, -2.29404\times 10^{7}, -5.02817\times 10^{6}, -1.00413\times 10^{6},$$
$$-182\,760., -30\,324.7, -4588.18, -633.139, -79.6984, -9.15291, -0.95915,$$
$$-0.0917243, -0.00800571, -0.000637785, -0.0000463816, -3.07927\times 10^{-6},$$
$$-1.86643\times 10^{-7}, -1.03291\times 10^{-8}, -5.21953\times 10^{-10}, -2.40844\times 10^{-11}, -1.01484\times 10^{-12},$$
$$-3.90518\times 10^{-14}, -1.3724\times 10^{-15}, -4.40484\times 10^{-17}, -1.29124\times 10^{-18}\}$$

In[407]:=
```
(* column d *)
nx1 = Table[
    (n[[k + 1]] - n[[k - 1]])/(x[[k + 1]] - x[[k - 1]])
    , {k, 2, Length[x] - 1}];
% // N
```

Out[408]=
$$\{-5.49099\times 10^{11}, -9.63402\times 10^{11}, -1.16173\times 10^{12}, -1.14108\times 10^{12},$$
$$-9.62845\times 10^{11}, -7.14673\times 10^{11}, -4.72546\times 10^{11}, -2.8043\times 10^{11}, -1.50086\times 10^{11},$$
$$-7.26786\times 10^{10}, -3.19173\times 10^{10}, -1.27329\times 10^{10}, -4.62021\times 10^{9}, -1.5263\times 10^{9},$$
$$-4.59396\times 10^{8}, -1.26054\times 10^{8}, -3.15464\times 10^{7}, -7.20325\times 10^{6}, -1.50114\times 10^{6},$$
$$-285\,584., -49\,608., -7869.48, -1140.18, -150.898, -18.2438, -2.01511,$$
$$-0.203358, -0.0187511, -0.00157985, -0.000121629, -8.55679\times 10^{-6},$$
$$-5.50102\times 10^{-7}, -3.2318\times 10^{-8}, -1.73509\times 10^{-9}, -8.51298\times 10^{-11},$$
$$-3.81706\times 10^{-12}, -1.56411\times 10^{-13}, -5.85736\times 10^{-15}, -2.00463\times 10^{-16}\}$$

In[437]:=
```
(* column e *)
relerror1 = Table[
    (nx1[[k]] - nx[[k + 1]]) / nx[[k + 1]]
    , {k, Length[nx1]}];
% // N
```

Out[438]= {-0.0427114, -0.0388318, -0.0323447, -0.0232187, -0.0114093, 0.00314109, 0.0205036, 0.0407632, 0.0640192, 0.090386, 0.119993, 0.152988, 0.189533, 0.22981, 0.274021, 0.322386, 0.37515, 0.432577, 0.494961, 0.562617, 0.635893, 0.715164, 0.80084, 0.893365, 0.99322, 1.10093, 1.21706, 1.34222, 1.47708, 1.62236, 1.77883, 1.94735, 2.12882, 2.32423, 2.53464, 2.76122, 3.00522, 3.26798, 3.55098}

```
(* column f *)
ln = Log[n];
% // N
```

Out[421]= {32.2362, 32.1912, 32.0562, 31.8312, 31.5162, 31.1112, 30.6162, 30.0312, 29.3562, 28.5912, 27.7362, 26.7912, 25.7562, 24.6312, 23.4162, 22.1112, 20.7162, 19.2312, 17.6562, 15.9912, 14.2362, 12.3912, 10.4562, 8.43119, 6.31619, 4.11119, 1.81619, -0.568809, -3.04381, -5.60881, -8.26381, -11.0088, -13.8438, -16.7688, -19.7838, -22.8888, -26.0838, -29.3688, -32.7438, -36.2088, -39.7638}

In[428]:=
```
(* column g *)
nx2 = Table[
    n[[k + 1]] (ln[[k]] - ln[[k + 2]]) / (x[[k]] - x[[k + 2]])
    , {k, Length[nx1]}];
% // N
```

Out[429]= $\{-5.73598\times10^{11}, -1.00232\times10^{12}, -1.20056\times10^{12}, -1.16821\times10^{12}, -9.73957\times10^{11}, -7.12435\times10^{11}, -4.63052\times10^{11}, -2.69447\times10^{11}, -1.41056\times10^{11}, -6.6654\times10^{10}, -2.84977\times10^{10}, -1.10434\times10^{10}, -3.88405\times10^{9}, -1.24109\times10^{9}, -3.60588\times10^{8}, -9.53232\times10^{7}, -2.29404\times10^{7}, -5.02817\times10^{6}, -1.00413\times10^{6}, -182\,760., -30\,324.7, -4588.18, -633.139, -79.6984, -9.15291, -0.95915, -0.0917243, -0.00800571, -0.000637785, -0.0000463816, -3.07927\times10^{-6}, -1.86643\times10^{-7}, -1.03291\times10^{-8}, -5.21953\times10^{-10}, -2.40844\times10^{-11}, -1.01484\times10^{-12}, -3.90518\times10^{-14}, -1.3724\times10^{-15}, -4.40484\times10^{-17}\}$

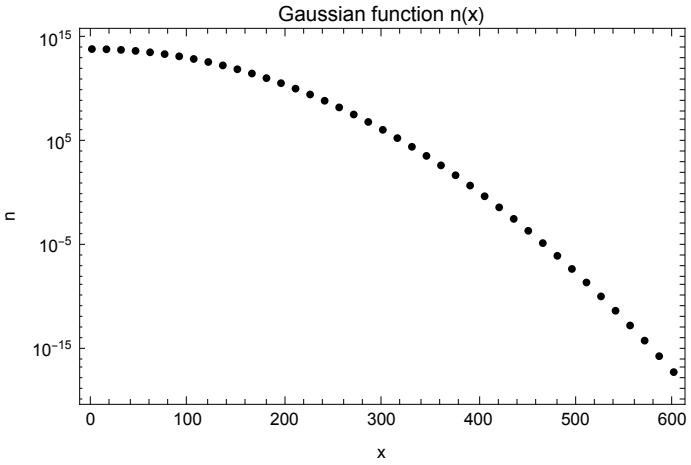
In[442]:=
```
(* column h *)
relerror2 = Table[
    nx2[[k]] - nx[[k + 1]]
    ----------------------
          nx[[k + 1]]
    , {k, Length[nx1]}];
% // N
```

Out[443]=
$$\{-1.4897\times10^{-15},\ -1.58323\times10^{-15},\ 4.88054\times10^{-15},\ -1.6719\times10^{-15},\ -1.50401\times10^{-15},\ 1.88477\times10^{-15},\ 1.31811\times10^{-15},\ -1.58564\times10^{-15},\ -1.51446\times10^{-15},\ 3.43388\times10^{-16},\ 2.67719\times10^{-16},\ 1.72713\times10^{-16},\ 0.,\ -1.92105\times10^{-16},\ -1.65299\times10^{-16},\ 9.37935\times10^{-16},\ 6.49561\times10^{-16},\ 0.,\ 0.,\ -4.77739\times10^{-16},\ 3.59903\times10^{-16},\ 1.98226\times10^{-16},\ 1.79561\times10^{-16},\ 0.,\ -1.94076\times10^{-16},\ 0.,\ 0.,\ -2.16686\times10^{-16},\ -1.69995\times10^{-16},\ 0.,\ -2.75076\times10^{-16},\ 7.09102\times10^{-16},\ 4.80493\times10^{-16},\ -3.96195\times10^{-16},\ -4.02481\times10^{-16},\ -3.97989\times10^{-16},\ 4.84809\times10^{-16},\ -4.31104\times10^{-16},\ -5.59655\times10^{-16}\}$$

3 plots

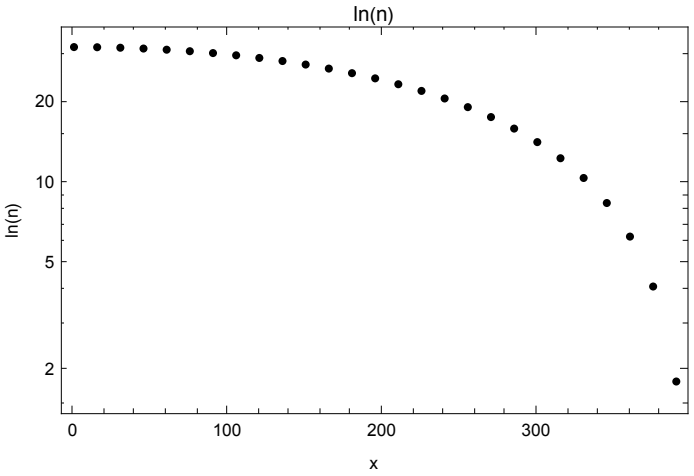
In[436]:=
```
ListLogPlot[{x, n}^T,
 PlotStyle → Black,
 PlotLabel → "Gaussian function n(x)",
 FrameLabel → {"x", "n"},
 Frame → True]
```

Out[436]=



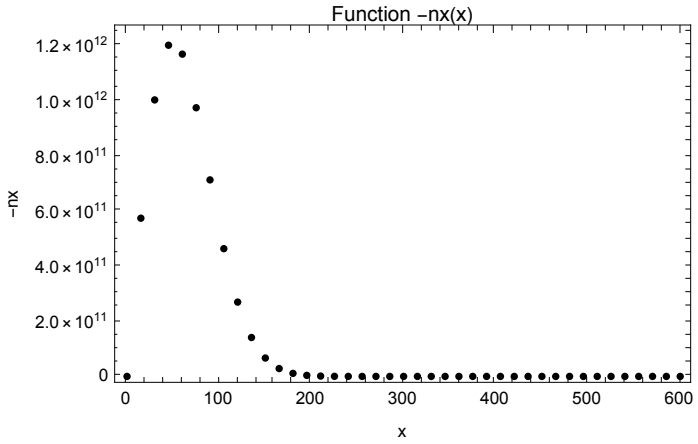
In[435]:=
```
ListLogPlot[{x, ln}ᵀ,
 PlotStyle → Black,
 PlotLabel → "ln(n)",
 FrameLabel → {"x", "ln(n)"},
 Frame → True]
```

Out[435]=



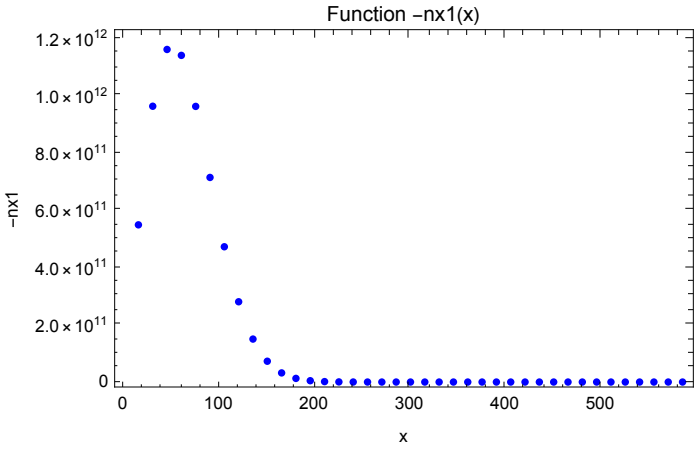
In[434]:=
```
ListPlot[{x, Abs[nx]}ᵀ,
 PlotStyle → Black,
 PlotLabel → "Function -nx(x)",
 FrameLabel → {"x", "-nx"},
 PlotRange → All,
 Frame → True]
```

Out[434]=



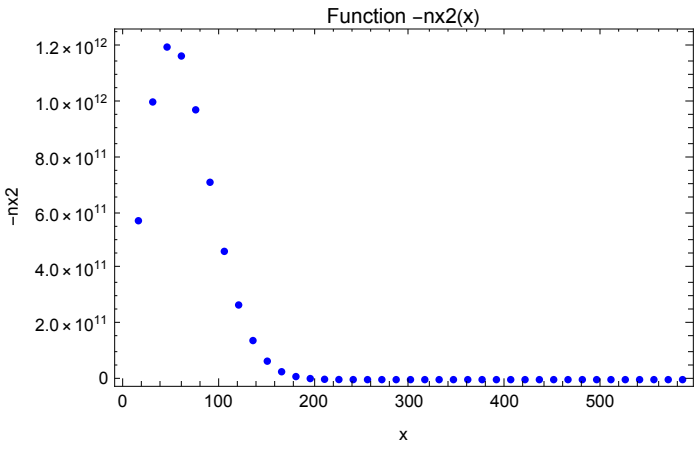
In[432]:=
```
x = Drop[Drop[x, -1], 1];
ListPlot[{x, Abs[nx1]}^T,
 PlotStyle → Blue, PlotLabel → "Function -nx1(x)",
 FrameLabel → {"x", "-nx1"},
 PlotRange → All,
 Frame → True]
```

Out[433]=



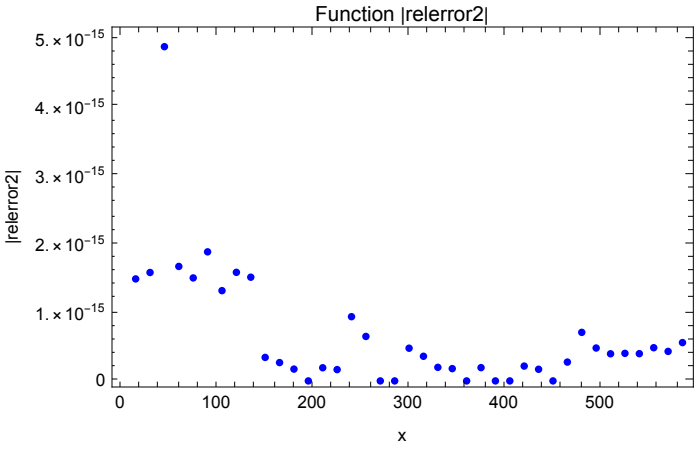
In[431]:=
```
ListPlot[{x, Abs[nx2]}^T,
 PlotStyle → Blue,
 PlotLabel → "Function -nx2(x)",
 FrameLabel → {"x", "-nx2"},
 PlotRange → All,
 Frame → True]
```

Out[431]=



In[447]:=
```
ListPlot[{x, Abs[relerror2 // N]}^T,
 PlotStyle → Blue,
 PlotLabel → "Function |relerror2|",
 FrameLabel → {"x", "|relerror2|"},
 PlotRange → All,
 Frame → True]
```

Out[447]=




```
relerror2
```

---

end