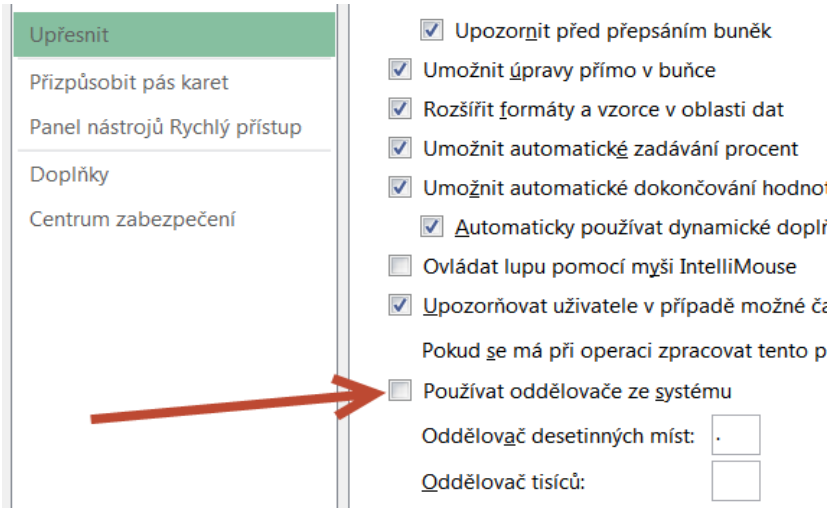
Excel jako tabulkový procesor

https://cs.wikipedia.org/wiki/Tabulkov%C3%BD_procesor

*Existují i další, v lecčems shodné tabulkové kalkulátory/procesory (**Open Office, LibreOffice**). My využije*
Podobné "spreadsheets" jsou součástí prakticky každého statistického programu či programu pro tvorbu



nastavení o
je užitečné

příklady na vysvětlení - kopírování vzorců

Přepočet jednotek glykemie

Ve většině států světa se glykemie standardně měří v jednotkách mmol/l.

V USA, Japonsku, Německu, Polsku či Itálii se dosud používá jednotka mg/dl. Chcete-li převé

Vydělte hodnotu glykemie v mg/dl číslem 18 (nebo vynásobte 0,055) a získáte hodnotu v mr

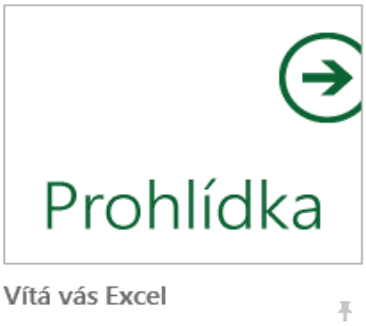
Vynásobte hodnotu glykemie v mmol/l číslem 18 (nebo vydělte 0,055) a získáte hodnotu gly

mmol/l	mg/dl
3.3	
5.1	
4.1	
	61.2
	51.2
	66.6

jiný příklad - ceník

CENA BEZ dph	s DPH
3100	
145	
546	
5456	
7889	

ɛme i freeware Gnumeric.
ı vědeckých grafů (Sigmaplot, Origin).



ɔddělovače des. čísel nás může potrápit v případech, kdy např. importujeme data z anglických softwarů ...
umět jej změnit

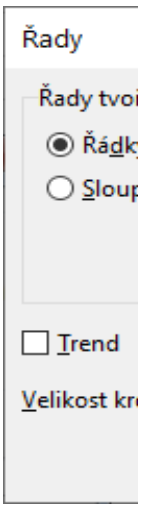
st jednotky mezi sebou:
ɲol/l.
'kemie v mg/dl.

Zobrazení průběhu funkce

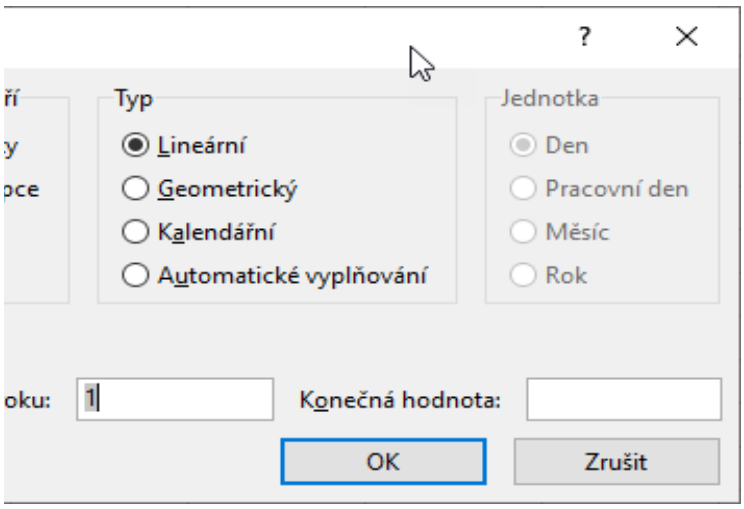
X	Y=x*x
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

1	6.1
1.1	5.8
1.2	5.5
1.3	5.2

Domů/Úpra



avy/Vyplnit


?
Typ
Lineární
Geometrický
Kalendářní
Automatické vyplňování
Jednotka
Den
Pracovní den
Měsíc
Rok
oku:
1
Konečná hodnota:
OK
Zrušit

Chytřejší tabulky v Excelu

pohlaví	věk	Ac/Pa
m	18	Pa
ž	19	Ac
m	19	Pa
ž	21	Ac
m	22	Ac
m	23	Ac
m	24	Pa
ž	25	Pa
m	25	Pa
ž	25	Ac
ž	26	Ac
ž	26	Pa
m	26	Pa
ž	26	Ac
m	29	Pa
ž	29	Ac
m	29	Pa
m	29	Pa
ž	30	Pa
ž	30	Ac
ž	30	Pa
m	31	Pa

AZENÍ VÝV

Vymazat

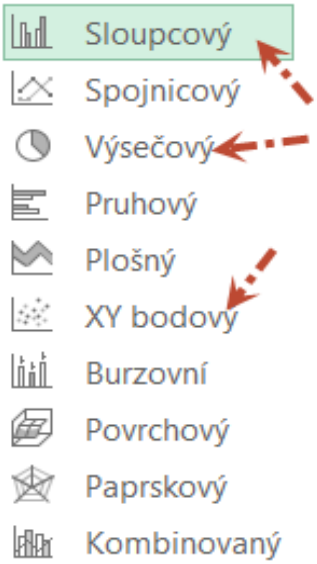
Použít znovu

Upřesnit

/at

tvorba grafů v Excelu

Excel 2019: i krabicový graf !



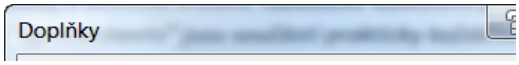
sestroj vhodný graf:

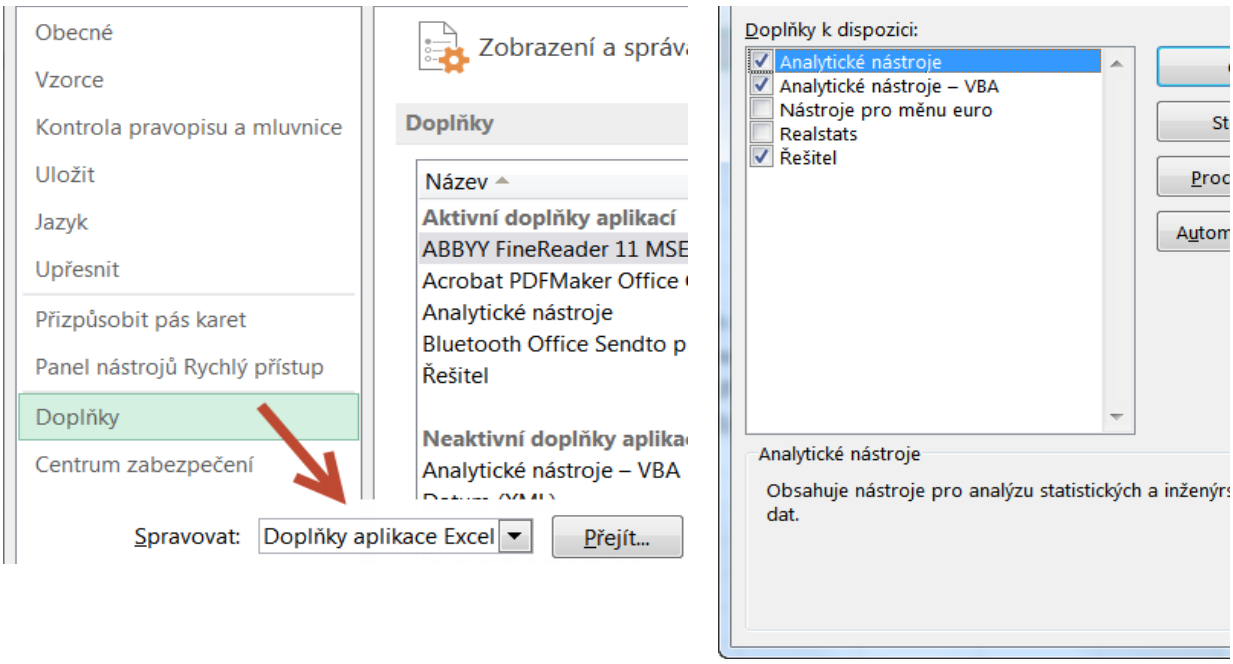
	BMI
pacient A	33.5
pacient B	25.3
kontrola1	27.1
kontrola2	40.7

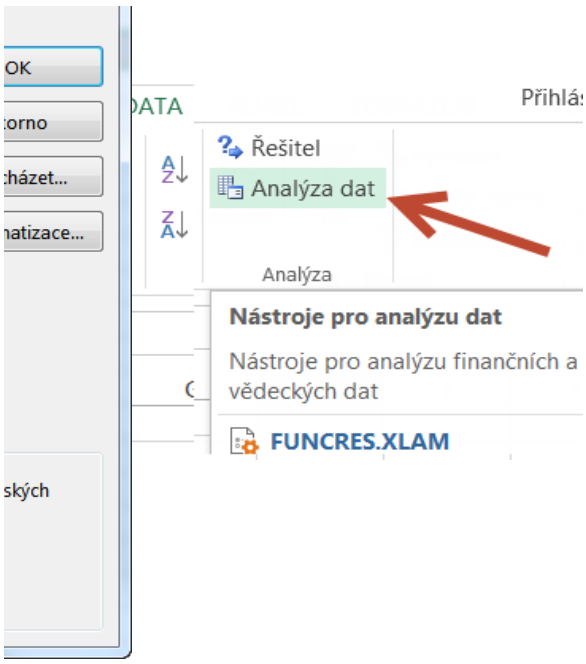
sestroj vhodný graf:

x	y
4	5
5	20
6	30
10	50

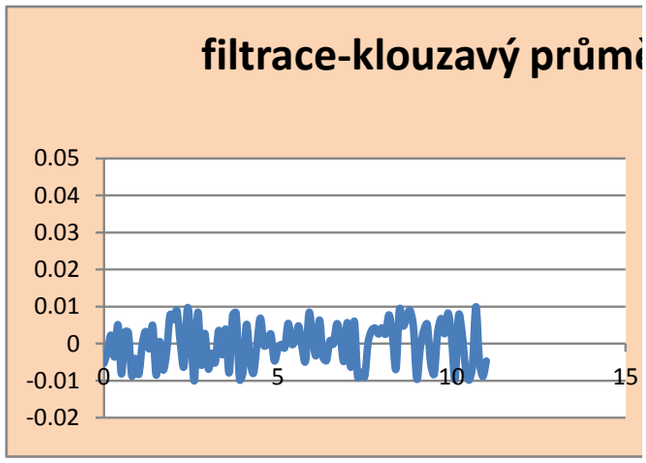
další možnosti pro statistickou analýzu




Obecné
Vzorce
Kontrola pravopisu a mluvnice
Uložit
Jazyk
Upřesnit
Přizpůsobit pás karet
Panel nástrojů Rychlý přístup
Doplňky
Centrum zabezpečení
Zobrazení a správ
Doplňky
Název
Aktivní doplňky aplikací
ABBYY FineReader 11 MSE
Acrobat PDFMaker Office
Analytické nástroje
Bluetooth Office Sendto p
Řešitel
Neaktivní doplňky aplika
Analytické nástroje – VBA
Spravovat:
Doplňky aplikace Excel
Přejít...
Doplňky k dispozici:
Analytické nástroje
Analytické nástroje – VBA
Nástroje pro měnu euro
Realstats
Řešitel
Analytické nástroje
Obsahuje nástroje pro analýzu statistických a inženýrs
dat.

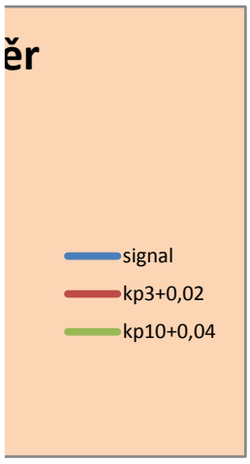

OK
orno
házet...
natizace...
ských
DATA
Přihlás
Řešitel
Analýza dat
Analýza
Nástroje pro analýzu dat
Nástroje pro analýzu finančních a vědeckých dat
FUNCRES.XLAM

t	signal	kp3+0,02	kp10+0,04
0	-0.0053		
0.1	-0.0021	0.0183	
0.2	0.0023		
0.3	-0.0036		
0.4	0.0051		
0.5	-0.0082		0.03816
0.6	0.0031		
0.7	0.003		
0.8	-0.0087		
0.9	-0.004		
1	-0.0083		
1.1	-0.0003		
1.2	0.0033		
1.3	-0.0014		
1.4	0.0049		
1.5	-0.0085		
1.6	0.0006		
1.7	-0.0071		
1.8	-0.0023		
1.9	0.0078		
2	0.0065		
2.1	0.0089		
2.2	-0.0002		
2.3	-0.0061		
2.4	0.0096		
2.5	0.0019		
2.6	-0.01		
2.7	0.0085		
2.8	-0.0058		
2.9	0.0028		
3	-0.0068		
3.1	-0.0026		
3.2	-0.0051		
3.3	0.0036		
3.4	-0.003		
3.5	0.0039		
3.6	-0.0079		
3.7	0.0076		
3.8	0.0083		
3.9	-0.0096		
4	-0.0076		
4.1	0.0052		
4.2	-0.0043		
4.3	-0.008		
4.4	-0.0002		
4.5	0.0069		
4.6	-0.0005		
4.7	-0.0002		
4.8	0.0026		
4.9	-0.0046		
5	-0.0015		
5.1	-0.0002		
5.2	-0.0011		
5.3	0.0055		

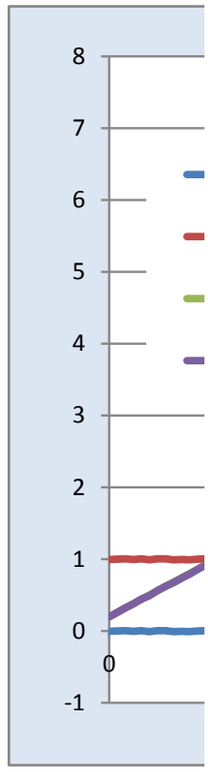


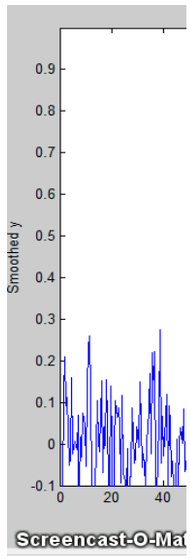
5.4	-0.0001
5.5	0.0008
5.6	0.0048
5.7	-0.0011
5.8	-0.0046
5.9	0.0084
6	0.0017
6.1	-0.0032
6.2	0.0064
6.3	-0.0036
6.4	-0.0046
6.5	0.0008
6.6	-0.0001
6.7	0.0054
6.8	0.0019
6.9	-0.0048
7	0.0057
7.1	-0.0064
7.2	0.0061
7.3	-0.0091
7.4	-0.0077
7.5	-0.0089
7.6	0.0004
7.7	0.0036
7.8	0.0042
7.9	0.0026
8	0.0043
8.1	0.0026
8.2	0.0078
8.3	0.0021
8.4	-0.0069
8.5	0.0092
8.6	0.0048
8.7	0.0066
8.8	0.0091
8.9	0.0048
9	-0.0096
9.1	-0.0011
9.2	0.0036
9.3	0.0052
9.4	-0.0054
9.5	-0.0082
9.6	0.003
9.7	0.0068
9.8	0.0027
9.9	0.0083
10	0.0018
10.1	-0.0097
10.2	0.0075
10.3	0.0031
10.4	-0.0064
10.5	-0.0099
10.6	-0.0063
10.7	0.01
10.8	-0.0047

10.9	-0.0089
11	-0.0047



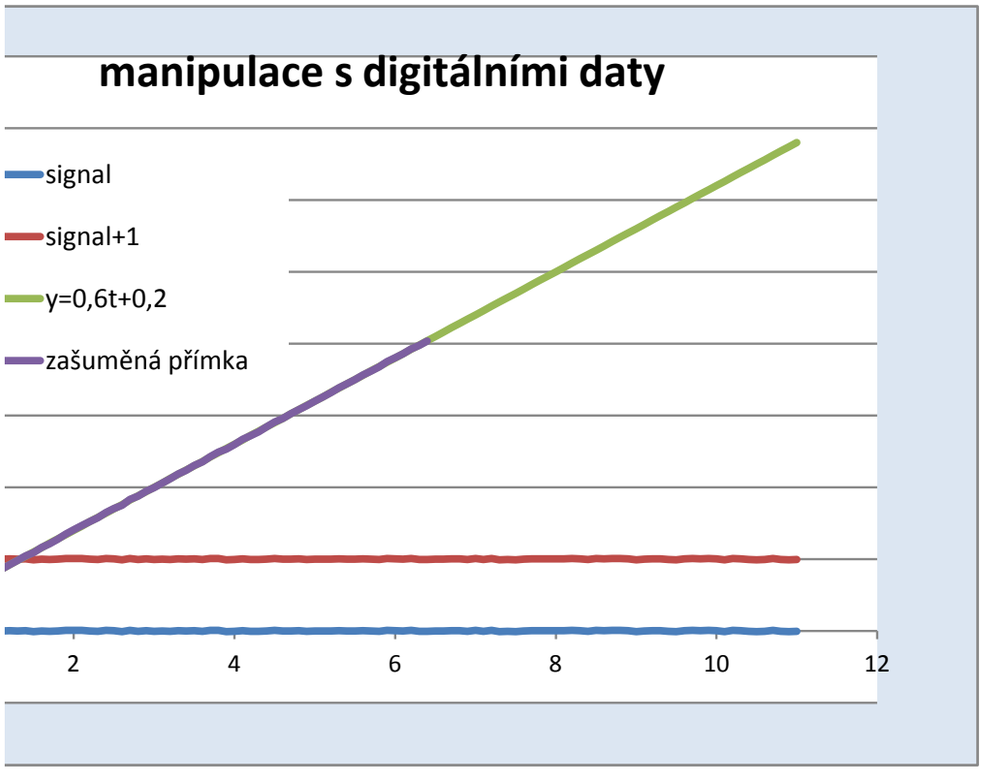
signal+1	y=0,6t+0,2	zašuměná přímka
0.9947	0.2	0.1947
0.9979	0.26	0.2579
1.0023	0.32	0.3223
0.9964	0.38	0.3764
1.0051	0.44	0.4451
0.9918	0.5	0.4918
1.0031	0.56	0.5631
1.003	0.62	0.623
0.9913	0.68	0.6713
0.996	0.74	0.736
0.9917	0.8	0.7917
0.9997	0.86	0.8597
1.0033	0.92	0.9233
0.9986	0.98	0.9786
1.0049	1.04	1.0449
0.9915	1.1	1.0915
1.0006	1.16	1.1606
0.9929	1.22	1.2129
0.9977	1.28	1.2777
1.0078	1.34	1.3478
1.0065	1.4	1.4065
1.0089	1.46	1.4689
0.9998	1.52	1.5198
0.9939	1.58	1.5739
1.0096	1.64	1.6496
1.0019	1.7	1.7019
0.99	1.76	1.75
1.0085	1.82	1.8285
0.9942	1.88	1.8742
1.0028	1.94	1.9428
0.9932	2	1.9932
0.9974	2.06	2.0574
0.9949	2.12	2.1149
1.0036	2.18	2.1836
0.997	2.24	2.237
1.0039	2.3	2.3039
0.9921	2.36	2.3521
1.0076	2.42	2.4276
1.0083	2.48	2.4883
0.9904	2.54	2.5304
0.9924	2.6	2.5924
1.0052	2.66	2.6652
0.9957	2.72	2.7157
0.992	2.78	2.772
0.9998	2.84	2.8398
1.0069	2.9	2.9069
0.9995	2.96	2.9595
0.9998	3.02	3.0198
1.0026	3.08	3.0826
0.9954	3.14	3.1354
0.9985	3.2	3.1985
0.9998	3.26	3.2598
0.9989	3.32	3.3189
1.0055	3.38	3.3855

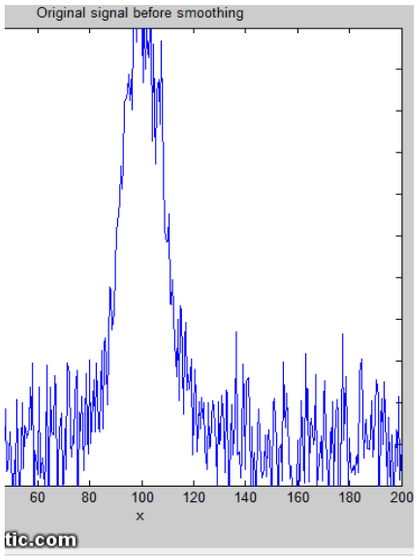




0.9999	3.44	3.4399
1.0008	3.5	3.5008
1.0048	3.56	3.5648
0.9989	3.62	3.6189
0.9954	3.68	3.6754
1.0084	3.74	3.7484
1.0017	3.8	3.8017
0.9968	3.86	3.8568
1.0064	3.92	3.9264
0.9964	3.98	3.9764
0.9954	4.04	4.0354
1.0008	4.1	4.1008
0.9999	4.16	4.1599
1.0054	4.22	4.2254
1.0019	4.28	4.2819
0.9952	4.34	4.3352
1.0057	4.4	4.4057
0.9936	4.46	4.4536
1.0061	4.52	4.5261
0.9909	4.58	4.5709
0.9923	4.64	4.6323
0.9911	4.7	4.6911
1.0004	4.76	4.7604
1.0036	4.82	4.8236
1.0042	4.88	4.8842
1.0026	4.94	4.9426
1.0043	5	5.0043
1.0026	5.06	5.0626
1.0078	5.12	5.1278
1.0021	5.18	5.1821
0.9931	5.24	5.2331
1.0092	5.3	5.3092
1.0048	5.36	5.3648
1.0066	5.42	5.4266
1.0091	5.48	5.4891
1.0048	5.54	5.5448
0.9904	5.6	5.5904
0.9989	5.66	5.6589
1.0036	5.72	5.7236
1.0052	5.78	5.7852
0.9946	5.84	5.8346
0.9918	5.9	5.8918
1.003	5.96	5.963
1.0068	6.02	6.0268
1.0027	6.08	6.0827
1.0083	6.14	6.1483
1.0018	6.2	6.2018
0.9903	6.26	6.2503
1.0075	6.32	6.3275
1.0031	6.38	6.3831
0.9936	6.44	6.4336
0.9901	6.5	6.4901
0.9937	6.56	6.5537
1.01	6.62	6.63
0.9953	6.68	6.6753

0.9911	6.74	6.7311
0.9953	6.8	6.7953


manipulace s digitálními daty
signal
signal+1
y=0,6t+0,2
zašuměná přímka
2
4
6
8
10
12


Original signal before smoothing
60
80
100
120
140
160
180
200
x
tic.com

t	šum	drift
0	-0.008	0.042
0.1	0.0124	0.0639
0.2	0.0062	0.0592
0.3	-0.018	0.0365
0.4	0.006	0.062
0.5	-0.0186	0.0389
0.6	-0.0042	0.0548
0.7	0.0008	0.0613
0.8	0.0064	0.0684
0.9	0.02	0.0835
1	-0.0052	0.0598
1.1	0.0078	0.0743
1.2	-0.009	0.059
1.3	-0.0188	0.0507
1.4	-0.0194	0.0516
1.5	-0.0172	0.0553
1.6	-0.0132	0.0608
1.7	-0.011	0.0645
1.8	-0.0092	0.0678
1.9	-0.0188	0.0597
2	-0.0002	0.0798
2.1	-0.005	0.0765
2.2	-0.0086	0.0744
2.3	-0.0156	0.0689
2.4	0.014	0.1
2.5	-0.0164	0.0711
2.6	0.009	0.098
2.7	0.0186	0.1091
2.8	-0.0104	0.0816
2.9	-0.0134	0.0801
3	0.0184	0.1134
3.1	0.0032	0.0997
3.2	-0.0042	0.0938
3.3	-0.0006	0.0989
3.4	-0.0156	0.0854
3.5	0.0158	0.1183
3.6	0.0156	0.1196
3.7	-0.013	0.0925
3.8	-0.0194	0.0876
3.9	-0.0046	0.1039
4	0.0012	0.1112
4.1	0.001	0.1125
4.2	0.006	0.119
4.3	-0.0184	0.0961
4.4	-0.015	0.101
4.5	-0.0134	0.1041
4.6	0.0192	0.1382
4.7	-0.0198	0.1007
4.8	-0.0098	0.1122
4.9	0.008	0.1315
5	-0.0126	0.1124
5.1	-0.0156	0.1109
5.2	-0.009	0.119

5.3	-0.016	0.1135
5.4	-0.0054	0.1256
5.5	0.0048	0.1373
5.6	0.0044	0.1384
5.7	-0.0082	0.1273
5.8	-0.0116	0.1254
5.9	0.001	0.1395
6	0.01	0.15
6.1	-0.013	0.1285
6.2	0.0164	0.1594
6.3	0.0156	0.1601
6.4	0.006	0.152
6.5	-0.0144	0.1331
6.6	0.0018	0.1508
6.7	-0.0168	0.1337
6.8	0.0084	0.1604
6.9	0.0088	0.1623
7	0.0116	0.1666
7.1	0.0172	0.1737
7.2	-0.0022	0.1558
7.3	-0.011	0.1485
7.4	0.0022	0.1632
7.5	-0.0032	0.1593
7.6	-0.0122	0.1518
7.7	0.0084	0.1739
7.8	0.014	0.181
7.9	-0.0148	0.1537
8	-0.0148	0.1552
8.1	-0.0014	0.1701
8.2	0.0174	0.1904
8.3	0.0088	0.1833
8.4	0.0188	0.1948
8.5	-0.0162	0.1613
8.6	0.0104	0.1894
8.7	0.0008	0.1813
8.8	-0.0118	0.1702
8.9	-0.0018	0.1817
9	-0.0176	0.1674
9.1	-0.001	0.1855
9.2	0.0044	0.1924
9.3	0.014	0.2035
9.4	-0.0196	0.1714
9.5	-0.0098	0.1827
9.6	0.0028	0.1968
9.7	0.0078	0.2033
9.8	0.019	0.216
9.9	0.0066	0.2051
10	0.0022	0.2022
10.1	-0.0022	0.1993
10.2	-0.0008	0.2022
10.3	-0.0006	0.2039
10.4	0.0096	0.2156
10.5	-0.0144	0.1931
10.6	-0.0132	0.1958
10.7	0.006	0.2165

10.8	-0.0174	0.1946
10.9	0.018	0.2315
11	-0.0048	0.2102
11.1	-0.0128	0.2037
11.2	0.0088	0.2268
11.3	-0.0162	0.2033
11.4	0.0054	0.2264
11.5	-0.008	0.2145
11.6	0.017	0.241
11.7	-0.008	0.2175
11.8	0.0158	0.2428
11.9	0.0072	0.2357
12	-0.0156	0.2144
12.1	-0.0196	0.2119
12.2	-0.0192	0.2138
12.3	0.0156	0.2501
12.4	0.0008	0.2368
12.5	-0.0056	0.2319
12.6	0.0076	0.2466
12.7	-0.0136	0.2269
12.8	0.006	0.248
12.9	0.0196	0.2631
13	0.0056	0.2506
13.1	0.015	0.2615
13.2	0.0072	0.2552
13.3	-0.0114	0.2381
13.4	0.017	0.268
13.5	0.0172	0.2697
13.6	0.009	0.263
13.7	-0.0048	0.2507
13.8	0.0194	0.2764
13.9	0.0054	0.2639
14	-0.0188	0.2412
14.1	0.0154	0.2769
14.2	-0.0052	0.2578
14.3	0.0032	0.2677
14.4	0.0026	0.2686
14.5	0.018	0.2855
14.6	0.014	0.283
14.7	0.0064	0.2769
14.8	-0.0058	0.2662
14.9	-0.0002	0.2733
15	0.0112	0.2862
15.1	0.0094	0.2859
15.2	-0.004	0.274
15.3	0.003	0.2825
15.4	-0.0086	0.2724
15.5	-0.0122	0.2703
15.6	-0.0152	0.2688
15.7	0.0072	0.2927
15.8	0.0196	0.3066
15.9	-0.0096	0.2789
16	-0.0102	0.2798
16.1	0.011	0.3025
16.2	0.0068	0.2998

16.3	-0.0146	0.2799
16.4	0.016	0.312
16.5	0.0052	0.3027
16.6	-0.0062	0.2928
16.7	-0.0014	0.2991
16.8	-0.0104	0.2916
16.9	-0.0066	0.2969
17	0.0138	0.3188
17.1	0.017	0.3235
17.2	-0.012	0.296
17.3	0.0146	0.3241
17.4	-0.0132	0.2978
17.5	-0.0058	0.3067
17.6	-0.0106	0.3034
17.7	-0.0132	0.3023
17.8	-0.0056	0.3114
17.9	0.0148	0.3333
18	0.0146	0.3346
18.1	-0.0006	0.3209
18.2	-0.0126	0.3104
18.3	0.0186	0.3431
18.4	0.0148	0.3408
18.5	-0.002	0.3255
18.6	0.0024	0.3314
18.7	0.016	0.3465
18.8	-0.002	0.33
18.9	0.0092	0.3427
19	0.0078	0.3428
19.1	0.0016	0.3381
19.2	-0.014	0.324
19.3	-0.0174	0.3221
19.4	0.0192	0.3602
19.5	-0.0158	0.3267
19.6	0.013	0.357
19.7	-0.0018	0.3437
19.8	-0.0108	0.3362
19.9	0.0172	0.3657
20	-0.0088	0.3412
20.1	0.0142	0.3657
20.2	0.0118	0.3648
20.3	-0.014	0.3405
20.4	-0.0194	0.3366
20.5	0.0096	0.3671
20.6	0.014	0.373
20.7	0.016	0.3765
20.8	0.0066	0.3686
20.9	0.0188	0.3823
21	0.0146	0.3796
21.1	-0.011	0.3555
21.2	0.001	0.369
21.3	-0.0124	0.3571
21.4	-0.0178	0.3532
21.5	-0.014	0.3585
21.6	0.0006	0.3746
21.7	0.0064	0.3819

21.8	-0.0186	0.3584
21.9	-0.0048	0.3737
22	-0.0066	0.3734
22.1	-0.0136	0.3679
22.2	-0.009	0.374
22.3	0.002	0.3865
22.4	-0.0132	0.3728
22.5	-0.0062	0.3813
22.6	0.0054	0.3944
22.7	-0.0152	0.3753
22.8	0.0146	0.4066
22.9	0.0152	0.4087
23	0.0198	0.4148
23.1	0.0154	0.4119
23.2	-0.0066	0.3914
23.3	0.017	0.4165
23.4	0.0068	0.4078
23.5	-0.0026	0.3999
23.6	-0.013	0.391
23.7	-0.0018	0.4037
23.8	0.0128	0.4198
23.9	-0.0192	0.3893
24	0.0014	0.4114
24.1	-0.0182	0.3933
24.2	0.0074	0.4204
24.3	-0.002	0.4125
24.4	-0.0118	0.4042
24.5	0.0118	0.4293
24.6	0.0042	0.4232
24.7	-0.0104	0.4101

úkoly:

1/ zobrazte šu
do stejnéhc
proveďte o

2/ znázorněte
odšuměte
odstraňte d

ım (sloupec C)
› grafu zobrazte odšuměný signál, okno=5
pakovanou filtraci, okno=5

drift (sloupec F)

rift odečtením vhodné rovnice přímky

t	signal
0	0.0046
0.1	0.003601
0.2	-0.019
0.3	-0.01179
0.4	0.003813
0.5	0.009427
0.6	0.020056
0.7	-0.01569
0.8	-0.01619
0.9	-0.00342
1	-0.00512
1.1	-0.01103
1.2	0.005956
1.3	0.012185
1.4	0.007452
1.5	-0.00518
1.6	0.012411
1.7	0.006847
1.8	0.038626
1.9	0.039136
2	0.06405
2.1	0.064719
2.2	0.096554
2.3	0.125209
2.4	0.146752
2.5	0.191034
2.6	0.231661
2.7	0.309754
2.8	0.374522
2.9	0.441023
3	0.564745
3.1	0.668581
3.2	0.745815
3.3	0.887718
3.4	1.033543
3.5	1.14994
3.6	1.321567
3.7	1.461711
3.8	1.617518
3.9	1.788017
4	1.942157
4.1	2.131238
4.2	2.283743
4.3	2.434371
4.4	2.628865
4.5	2.753439
4.6	2.912799
4.7	3.066765
4.8	3.189881

plocha

těžiště

variance

4.9	3.34663
5	3.433837
5.1	3.546675
5.2	3.64426
5.3	3.714855
5.4	3.802055
5.5	3.885588
5.6	3.918699
5.7	3.964942
5.8	3.98717
5.9	3.983719
6	4.0172
6.1	3.975885
6.2	3.996497
6.3	3.971397
6.4	3.907774
6.5	3.89064
6.6	3.820814
6.7	3.796322
6.8	3.738182
6.9	3.680406
7	3.59019
7.1	3.528512
7.2	3.449926
7.3	3.347963
7.4	3.286925
7.5	3.201687
7.6	3.114694
7.7	3.04616
7.8	2.932669
7.9	2.860975
8	2.777003
8.1	2.670847
8.2	2.597376
8.3	2.522831
8.4	2.424627
8.5	2.357555
8.6	2.250582
8.7	2.175055
8.8	2.098501
8.9	2.003228
9	1.956724
9.1	1.851265
9.2	1.79331
9.3	1.724906
9.4	1.667685
9.5	1.571872
9.6	1.517477
9.7	1.464107
9.8	1.410355

9.9	1.355811
10	1.305057
10.1	1.220471
10.2	1.176623
10.3	1.128083
10.4	1.084614
10.5	1.041377
10.6	1.002333
10.7	0.938236
10.8	0.918244
10.9	0.857109
11	0.802784
11.1	0.785623
11.2	0.741377
11.3	0.723198
11.4	0.699239
11.5	0.65005
11.6	0.621986
11.7	0.5812
11.8	0.570845
11.9	0.540276
12	0.509049
12.1	0.492921
12.2	0.466449
12.3	0.459992
12.4	0.42951
12.5	0.410763
12.6	0.373513
12.7	0.376525
12.8	0.344561
12.9	0.339189
13	0.301373
13.1	0.307683
13.2	0.295286
13.3	0.267354
13.4	0.281057
13.5	0.234568
13.6	0.250459
13.7	0.228906
13.8	0.217483
13.9	0.203166
14	0.189934
14.1	0.169964
14.2	0.165435
14.3	0.169728
14.4	0.176222
14.5	0.1703
14.6	0.163944
14.7	0.133938
14.8	0.132864

14.9	0.126108
15	0.108255
15.1	0.099891
15.2	0.094202
15.3	0.099575
15.4	0.079599
15.5	0.101261
15.6	0.09415
15.7	0.084455
15.8	0.064167
15.9	0.090275
16	0.077971
16.1	0.082844
16.2	0.051288
16.3	0.055493
16.4	0.065652
16.5	0.045958
16.6	0.060604
16.7	0.057183
16.8	0.053088
16.9	0.043314
17	0.040655
17.1	0.030705
17.2	0.038259
17.3	0.028912
17.4	0.04726
17.5	0.037697
17.6	0.036019
17.7	0.034423
17.8	0.026705
17.9	0.00906
18	0.038285
18.1	0.013177
18.2	0.040332
18.3	0.020148
18.4	0.004222
18.5	0.00835
18.6	0.03333
18.7	-0.00084
18.8	0.002436
18.9	-0.00264
19	0.018923
19.1	0.013328
19.2	0.031971
19.3	-0.00035
19.4	0.022567
19.5	0.007916
19.6	0.014897
19.7	0.000507
19.8	0.015347

19.9	0.013813
20	0.012306
20.1	0.011823
20.2	-0.00764
20.3	0.015527
20.4	0.017912
20.5	0.002116
20.6	0.01734
20.7	0.022183
20.8	-0.00936
20.9	-0.01048
21	-0.00899
21.1	-0.00348
21.2	0.005639
21.3	-0.01263
21.4	0.000321
21.5	0.001482
21.6	-0.00235
21.7	0.017636
21.8	-0.01297
21.9	0.012033
22	0.015646
22.1	0.013069
22.2	0.020899
22.3	-0.00306
22.4	-0.00141
22.5	-0.01516
22.6	-0.0119
22.7	0.01077
22.8	-0.01276
22.9	0.004125
23	-0.00319
23.1	0.013304
23.2	0.001201
23.3	0.019304
23.4	-0.01219
23.5	0.015323
23.6	-0.01156
23.7	0.002959
23.8	0.019683
23.9	0.00301

úkoly:

1/ zobrazte signál
do stejného grafu zobrazte hranice integrace
proveďte numerickou integraci dané plochy píku

2/ zjistěte čas maxima
podle vzorců pro statistické momenty vypočítejte časovou souřadn

$$m_0 = \int_{-\infty}^{+\infty} t^0 . h_t \, dt \qquad m_0 = \sum_{1}^{18} (1 * h_i * \Delta t) = \Delta t \sum_{1}^{18} h_i$$

$$m_1 = \frac{1}{m_0} \int_{-\infty}^{+\infty} t^1 . h_t \, dt \qquad m_1 = \frac{1}{m_0} \sum (t * h_i * \Delta t) = \frac{\Delta t}{m_0} \sum (t_i * h_i)$$

$$m_2 = \frac{1}{m_0} \int_{-\infty}^{+\infty} t^2 . h_t \, dt \qquad m_2 = \frac{1}{m_0} \sum (t^2 * h_i * \Delta t) = \frac{\Delta t}{m_0} \sum (t_i^2 * h_i)$$

ıici těžiště

time (min)	signal (mV)
0.00	1.000
0.01	1.600
0.02	1.300
0.03	1.300
0.04	1.500
0.05	-0.600
0.06	0.200
0.07	-0.400
0.08	1.900
0.09	0.000
0.10	0.000
0.11	1.600
0.12	1.000
0.13	0.600
0.14	0.300
0.15	-0.700
0.16	2.300
0.17	1.000
0.18	0.600
0.19	-0.500
0.20	2.700
0.21	0.100
0.22	-0.300
0.23	2.800
0.24	0.600
0.25	-0.200
0.26	1.000
0.27	0.100
0.28	2.500
0.29	0.600
0.30	-0.100
0.31	0.800
0.32	1.400
0.33	-0.800
0.34	0.700
0.35	1.800
0.36	1.600
0.37	-0.200
0.38	0.600
0.39	0.800
0.40	1.500
0.41	-0.300
0.42	1.900
0.43	0.400
0.44	2.400
0.45	1.200
0.46	1.500
0.47	0.200
0.48	0.000

úkoly:

1/ zobrazte signál
do stejného grafu zobrazte hranice
proveďte numerickou integraci dar

2/ zjistěte čas maxima
podle vzorců pro statistické mome

0.49	1.000
0.50	0.000
0.51	2.000
0.52	-0.500
0.53	-0.100
0.54	0.300
0.55	1.200
0.56	1.100
0.57	1.200
0.58	1.200
0.59	0.800
0.60	1.000
0.61	0.900
0.62	1.200
0.63	-0.800
0.64	-0.500
0.65	1.200
0.66	0.000
0.67	0.700
0.68	0.400
0.69	1.500
0.70	1.900
0.71	0.700
0.72	-0.200
0.73	1.300
0.74	3.000
0.75	1.400
0.76	1.600
0.77	1.400
0.78	0.500
0.79	0.900
0.80	2.000
0.81	1.500
0.82	0.200
0.83	0.600
0.84	1.900
0.85	0.514
0.86	1.525
0.87	2.849
0.88	11.020
0.89	22.220
0.90	32.944
0.91	22.720
0.92	8.320
0.93	3.049
0.94	0.125
0.95	3.014
0.96	1.500
0.97	0.900
0.98	0.600

0.99	0.700
1.00	1.700
1.01	-0.700
1.02	0.900
1.03	2.000
1.04	-0.100
1.05	1.700
1.06	1.500
1.07	0.600
1.08	1.800
1.09	0.700
1.10	0.400
1.11	1.800
1.12	1.600
1.13	1.100
1.14	0.700
1.15	-0.800
1.16	0.800
1.17	1.700
1.18	1.000
1.19	0.600
1.20	1.100
1.21	2.400
1.22	0.100
1.23	0.000
1.24	1.900
1.25	0.900
1.26	0.900
1.27	-0.200
1.28	-0.100
1.29	0.700
1.30	1.200
1.31	1.000
1.32	2.100
1.33	1.200
1.34	1.500
1.35	1.300
1.36	1.600
1.37	2.000
1.38	1.300
1.39	2.700
1.40	1.900
1.41	-0.700
1.42	1.000
1.43	1.400
1.44	-0.600
1.45	2.000
1.46	1.800
1.47	1.000
1.48	0.400

1.49	2.800
1.50	1.000
1.51	0.600
1.52	0.100
1.53	2.500
1.54	1.300
1.55	0.300
1.56	1.200
1.57	0.800
1.58	1.200
1.59	1.300
1.60	0.600
1.61	0.900
1.62	-0.400
1.63	2.900
1.64	-0.500
1.65	0.800
1.66	2.100
1.67	0.400
1.68	1.800
1.69	0.600
1.70	2.000
1.71	2.300
1.72	0.701
1.73	-0.399
1.74	0.603
1.75	0.506
1.76	1.314
1.77	0.730
1.78	1.362
1.79	0.523
1.80	2.837
1.81	0.843
1.82	0.500
1.83	2.701
1.84	2.375
1.85	5.300
1.86	6.503
1.87	11.154
1.88	15.653
1.89	20.493
1.90	29.117
1.91	40.754
1.92	52.662
1.93	66.167
1.94	80.235
1.95	97.175
1.96	112.093
1.97	124.088
1.98	136.581

1.99	142.164
2.00	144.530
2.01	142.164
2.02	134.781
2.03	124.688
2.04	111.693
2.05	97.575
2.06	80.835
2.07	67.767
2.08	53.562
2.09	40.954
2.10	29.317
2.11	21.193
2.12	16.153
2.13	9.454
2.14	6.703
2.15	5.500
2.16	3.175
2.17	3.401
2.18	1.400
2.19	1.943
2.20	0.737
2.21	1.323
2.22	0.162
2.23	1.530
2.24	1.614
2.25	-0.594
2.26	2.003
2.27	0.901
2.28	0.401
2.29	0.200
2.30	1.500
2.31	3.000
2.32	2.000
2.33	0.800
2.34	0.700
2.35	1.700
2.36	2.100
2.37	-0.200
2.38	2.400
2.39	0.900
2.40	2.400
2.41	1.900
2.42	1.600
2.43	0.000
2.44	1.700
2.45	0.700
2.46	2.200
2.47	0.600
2.48	1.201

2.49	2.601
2.50	2.203
2.51	0.805
2.52	0.711
2.53	0.923
2.54	1.745
2.55	1.286
2.56	-0.540
2.57	0.093
2.58	1.621
2.59	3.703
2.60	2.626
2.61	3.014
2.62	4.436
2.63	6.218
2.64	10.338
2.65	14.832
2.66	22.475
2.67	31.251
2.68	40.520
2.69	56.557
2.70	72.389
2.71	92.834
2.72	114.542
2.73	138.364
2.74	163.652
2.75	186.203
2.76	209.140
2.77	228.741
2.78	242.980
2.79	253.176
2.80	257.523
2.81	251.076
2.82	244.380
2.83	229.241
2.84	208.940
2.85	186.503
2.86	163.052
2.87	136.764
2.88	113.142
2.89	91.134
2.90	72.489
2.91	54.757
2.92	42.120
2.93	29.151
2.94	21.675
2.95	14.432
2.96	10.838
2.97	8.518
2.98	4.336

2.99	1.814
3.00	0.726
3.01	3.303
3.02	0.021
3.03	0.393
3.04	0.860
3.05	1.686
3.06	1.045
3.07	2.123
3.08	0.811
3.09	1.805
3.10	1.303
3.11	-0.399
3.12	1.901
3.13	0.000
3.14	1.600
3.15	-0.900
3.16	-0.300
3.17	0.700
3.18	-0.500
3.19	0.300
3.20	2.200
3.21	1.800
3.22	0.300
3.23	2.801
3.24	2.802
3.25	1.503
3.26	0.905
3.27	0.910
3.28	0.218
3.29	-0.169
3.30	1.554
3.31	2.390
3.32	1.150
3.33	2.645
3.34	1.592
3.35	1.217
3.36	1.054
3.37	2.948
3.38	4.360
3.39	3.666
3.40	5.558
3.41	7.647
3.42	10.358
3.43	13.227
3.44	18.095
3.45	23.996
3.46	30.747
3.47	36.727
3.48	44.368

3.49	55.633
3.50	66.904
3.51	77.574
3.52	91.545
3.53	103.631
3.54	117.377
3.55	129.479
3.56	140.522
3.57	149.409
3.58	154.304
3.59	158.966
3.60	159.880
3.61	158.369
3.62	155.610
3.63	149.920
3.64	140.041
3.65	129.610
3.66	116.725
3.67	103.005
3.68	91.159
3.69	78.946
3.70	67.060
3.71	56.409
3.72	45.213
3.73	38.508
3.74	30.850
3.75	23.336
3.76	19.615
3.77	14.508
3.78	14.423
3.79	11.266
3.80	13.049
3.81	11.497
3.82	13.450
3.83	16.961
3.84	19.188
3.85	22.996
3.86	26.545
3.87	30.287
3.88	35.556
3.89	41.367
3.90	47.312
3.91	53.759
3.92	59.754
3.93	67.725
3.94	72.488
3.95	78.154
3.96	83.941
3.97	87.383
3.98	90.736

3.99	93.193
4.00	91.787
4.01	89.593
4.02	89.736
4.03	86.882
4.04	84.240
4.05	79.751
4.06	72.382
4.07	68.215
4.08	60.836
4.09	55.728
4.10	46.758
4.11	43.876
4.12	35.306
4.13	31.542
4.14	26.353
4.15	22.379
4.16	17.634
4.17	14.912
4.18	13.590
4.19	8.831
4.20	7.290
4.21	6.119
4.22	4.766
4.23	3.881
4.24	3.120
4.25	3.139
4.26	2.103
4.27	2.080
4.28	1.945
4.29	1.876
4.30	3.055
4.31	1.572
4.32	0.714
4.33	0.374
4.34	-0.152
4.35	0.431
4.36	1.519
4.37	2.112
4.38	1.107
4.39	1.704
4.40	-0.397
4.41	1.902
4.42	2.101
4.43	2.401
4.44	0.400
4.45	2.500
4.46	-0.100
4.47	0.800
4.48	1.500

4.49	2.400
4.50	-0.400
4.51	0.300
4.52	0.900
4.53	-0.700
4.54	0.700
4.55	1.400
4.56	0.800
4.57	0.800
4.58	0.600
4.59	1.500
4.60	2.000
4.61	2.500
4.62	0.600
4.63	1.000
4.64	1.400
4.65	0.900
4.66	2.100
4.67	0.400
4.68	1.700
4.69	1.300
4.70	0.900
4.71	-0.100
4.72	0.300
4.73	1.100
4.74	2.400
4.75	1.000
4.76	1.000
4.77	2.000
4.78	0.200
4.79	2.000
4.80	0.700
4.81	2.600
4.82	0.100
4.83	1.500
4.84	3.000
4.85	0.300
4.86	0.800
4.87	1.900
4.88	-0.200
4.89	1.000
4.90	2.400
4.91	0.500
4.92	-0.300
4.93	2.600
4.94	0.900
4.95	1.400
4.96	1.300
4.97	2.900
4.98	1.600

4.99	1.400
5.00	-0.300
5.01	1.300
5.02	1.000
5.03	2.600
5.04	1.500
5.05	1.700
5.06	0.200
5.07	1.300
5.08	1.400
5.09	2.300
5.10	1.401
5.11	1.601
5.12	-0.699
5.13	0.802
5.14	1.402
5.15	2.803
5.16	1.005
5.17	2.206
5.18	2.009
5.19	1.612
5.20	-0.183
5.21	1.723
5.22	2.232
5.23	1.343
5.24	2.558
5.25	-0.322
5.26	0.404
5.27	0.738
5.28	1.682
5.29	1.039
5.30	2.712
5.31	1.806
5.32	2.124
5.33	-0.026
5.34	1.362
5.35	1.096
5.36	2.487
5.37	1.846
5.38	3.086
5.39	4.723
5.40	4.573
5.41	5.457
5.42	5.196
5.43	7.213
5.44	10.037
5.45	9.093
5.46	11.614
5.47	15.330
5.48	17.673

5.49	19.679
5.50	23.079
5.51	26.006
5.52	29.590
5.53	36.560
5.54	41.140
5.55	47.048
5.56	52.098
5.57	58.195
5.58	65.736
5.59	71.808
5.60	82.889
5.61	89.645
5.62	100.330
5.63	110.385
5.64	117.642
5.65	129.419
5.66	139.524
5.67	149.054
5.68	160.201
5.69	169.548
5.70	179.673
5.71	188.455
5.72	198.270
5.73	204.401
5.74	211.733
5.75	217.762
5.76	223.295
5.77	229.152
5.78	229.769
5.79	233.099
5.80	232.012
5.81	230.599
5.82	230.469
5.83	226.952
5.84	223.795
5.85	218.062
5.86	212.433
5.87	203.701
5.88	196.770
5.89	188.155
5.90	179.473
5.91	171.148
5.92	159.801
5.93	148.654
5.94	140.124
5.95	129.419
5.96	117.242
5.97	109.985
5.98	100.030

5.99	92.045
6.00	81.289
6.01	74.008
6.02	65.436
6.03	59.295
6.04	50.898
6.05	45.548
6.06	39.140
6.07	35.060
6.08	30.390
6.09	26.606
6.10	22.479
6.11	20.179
6.12	16.673
6.13	13.130
6.14	11.614
6.15	11.693
6.16	7.437
6.17	7.213
6.18	5.196
6.19	4.657
6.20	3.673
6.21	4.723
6.22	4.286
6.23	2.646
6.24	2.387
6.25	1.196
6.26	1.362
6.27	1.074
6.28	1.224
6.29	1.206
6.30	1.312
6.31	1.839
6.32	0.582
6.33	-0.362
6.34	1.504
6.35	0.878
6.36	0.558
6.37	0.343
6.38	1.832
6.39	0.723
6.40	1.517
6.41	-0.188
6.42	2.609
6.43	1.206
6.44	-0.795
6.45	2.003
6.46	1.202
6.47	1.102
6.48	1.201

6.49	1.001
6.50	0.601
6.51	0.400
6.52	2.600
6.53	1.500
6.54	0.300
6.55	1.100
6.56	1.000
6.57	0.900
6.58	1.900
6.59	0.800
6.60	1.600
6.61	1.400
6.62	0.300
6.63	1.000
6.64	2.200
6.65	1.600
6.66	0.500
6.67	-0.100
6.68	1.900
6.69	-0.300
6.70	1.800
6.71	2.600
6.72	1.700
6.73	1.100
6.74	2.700
6.75	1.700
6.76	0.500
6.77	1.600
6.78	2.000
6.79	1.900
6.80	1.200
6.81	0.700
6.82	1.200
6.83	1.500
6.84	0.500
6.85	0.400
6.86	1.100
6.87	0.600
6.88	2.100
6.89	2.100
6.90	0.700
6.91	1.700
6.92	2.600
6.93	0.801
6.94	0.001
6.95	1.501
6.96	-0.199
6.97	1.502
6.98	0.403

6.99	1.103
7.00	1.004
7.01	0.706
7.02	-0.193
7.03	1.709
7.04	0.012
7.05	0.715
7.06	0.720
7.07	1.225
7.08	2.032
7.09	0.540
7.10	1.751
7.11	-0.236
7.12	1.080
7.13	-0.100
7.14	1.824
7.15	-0.346
7.16	0.491
7.17	3.235
7.18	1.589
7.19	-0.147
7.20	1.331
7.21	1.124
7.22	2.435
7.23	1.568
7.24	2.324
7.25	1.909
7.26	2.427
7.27	2.282
7.28	2.080
7.29	4.527
7.30	5.429
7.31	4.894
7.32	4.829
7.33	6.842
7.34	6.743
7.35	6.540
7.36	8.644
7.37	8.866
7.38	10.115
7.39	10.204
7.40	12.442
7.41	13.643
7.42	15.316
7.43	18.773
7.44	20.524
7.45	23.679
7.46	25.146
7.47	27.034
7.48	30.949

7.49	35.594
7.50	38.874
7.51	40.388
7.52	46.335
7.53	50.711
7.54	54.408
7.55	59.017
7.56	64.224
7.57	67.714
7.58	72.166
7.59	79.158
7.60	84.265
7.61	89.358
7.62	93.604
7.63	99.571
7.64	105.421
7.65	112.316
7.66	117.116
7.67	122.981
7.68	126.768
7.69	132.137
7.70	136.546
7.71	140.455
7.72	145.126
7.73	147.824
7.74	151.714
7.75	153.668
7.76	156.158
7.77	158.263
7.78	160.964
7.79	161.251
7.80	160.514
7.81	160.674
7.82	161.053
7.83	160.851
7.84	160.668
7.85	160.403
7.86	159.357
7.87	158.629
7.88	160.320
7.89	157.330
7.90	156.560
7.91	156.109
7.92	156.080
7.93	153.672
7.94	153.387
7.95	151.226
7.96	150.890
7.97	149.380
7.98	149.099

7.99	146.647
8.00	145.526
8.01	142.439
8.02	141.988
8.03	139.573
8.04	140.099
8.05	136.066
8.06	135.177
8.07	132.736
8.08	129.444
8.09	129.603
8.10	125.818
8.11	124.790
8.12	120.722
8.13	121.117
8.14	118.679
8.15	115.610
8.16	114.913
8.17	110.991
8.18	109.647
8.19	106.284
8.20	102.905
8.21	100.214
8.22	99.112
8.23	96.304
8.24	95.392
8.25	92.080
8.26	90.469
8.27	87.063
8.28	84.364
8.29	82.276
8.30	79.301
8.31	76.241
8.32	74.199
8.33	71.877
8.34	70.378
8.35	68.904
8.36	67.457
8.37	63.939
8.38	61.953
8.39	60.499
8.40	57.079
8.41	54.696
8.42	55.050
8.43	52.343
8.44	50.477
8.45	46.652
8.46	47.269
8.47	43.130
8.48	42.135

8.49	40.385
8.50	36.780
8.51	35.622
8.52	37.010
8.53	34.244
8.54	32.625
8.55	31.953
8.56	29.528
8.57	28.550
8.58	25.818
8.59	24.633
8.60	23.493
8.61	22.799
8.62	21.950
8.63	19.545
8.64	20.384
8.65	18.066
8.66	18.590
8.67	15.556
8.68	15.462
8.69	14.008
8.70	14.092
8.71	13.514
8.72	11.974
8.73	12.268
8.74	10.298
8.75	11.161
8.76	8.857
8.77	9.584
8.78	9.742
8.79	6.529
8.80	9.044
8.81	7.187
8.82	7.555
8.83	6.849
8.84	4.967
8.85	4.807
8.86	4.870
8.87	5.953
8.88	5.056
8.89	5.179
8.90	3.419
8.91	3.976
8.92	2.950
8.93	2.539
8.94	3.543
8.95	3.460
8.96	2.691
8.97	2.533
8.98	2.387

8.99	2.452
9.00	3.027
9.01	1.512
9.02	4.105
9.03	3.207
9.04	1.516
9.05	2.233
9.06	0.557
9.07	1.186
9.08	1.622
9.09	-0.137
9.10	2.009
9.11	0.060
9.12	2.215
9.13	1.474
9.14	0.437
9.15	3.103
9.16	0.572
9.17	1.644
9.18	2.119
9.19	0.996
9.20	1.075
9.21	-0.343
9.22	0.840
9.23	0.725
9.24	1.411
9.25	0.999
9.26	0.488
9.27	2.278
9.28	-0.231
9.29	-0.139
9.30	1.454
9.31	1.148
9.32	0.242
9.33	0.237
9.34	0.333
9.35	1.729
9.36	1.225
9.37	2.722
9.38	0.519
9.39	0.917
9.40	1.315
9.41	0.313
9.42	1.811
9.43	1.710
9.44	-0.392
9.45	1.807
9.46	1.506
9.47	2.106
9.48	3.005

9.49	0.804
9.50	1.104
9.51	-0.397
9.52	1.503
9.53	-0.398
9.54	0.602
9.55	-0.298
9.56	1.201
9.57	1.201
9.58	2.001
9.59	0.801
9.60	0.001
9.61	1.901
9.62	0.101
9.63	0.100
9.64	1.100
9.65	0.700
9.66	-0.200
9.67	0.900
9.68	1.600
9.69	0.300
9.70	0.400
9.71	1.300
9.72	-0.300
9.73	0.200
9.74	-0.100
9.75	1.700
9.76	1.600
9.77	2.500
9.78	1.200
9.79	2.700
9.80	1.000
9.81	-0.800
9.82	1.200
9.83	1.200
9.84	-0.200
9.85	1.300
9.86	-0.600
9.87	1.300
9.88	0.200
9.89	1.300
9.90	0.700
9.91	1.600
9.92	0.700
9.93	2.500
9.94	1.700
9.95	2.300
9.96	1.900
9.97	0.300
9.98	1.200

9.99	1.300
10.00	0.900

e integrace
né plochy píku

nty vypočítejte časovou souřadnici těžiště