

Сборник заданий для БДЗ по
вычислительной математике

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Содержание

1	Задание I	3
2	Задание II	6
3	Задание III	10
4	Задание IV	16
5	Задание V	25
6	Задание VI	40
7	Задание VII	58
8	Задание VIII	69
9	Задание IX	90
10	Задание X	90

1 Задание I

I. Даны числа A_i и B_i . Записать их с одной, двумя, тремя и четырьмя значащими цифрами.

$$A_1 = 924,1839; B_1 = 0,0038786$$

$$A_2 = 17,615876; B_2 = 0,0096313$$

$$A_3 = 28437,3; B_3 = 0,47348326$$

$$A_4 = 834855,3; B_4 = 0,00671256$$

$$A_5 = 678647,4; B_5 = 0,0316121$$

$$A_6 = 27,432; B_6 = 0,00032947913$$

$$A_7 = 133499; B_7 = 0,06277344$$

$$A_8 = 7994,592; B_8 = 0,000984882$$

$$A_9 = 5377,6983; B_9 = 0,000346838$$

$$A_{10} = 79564,9; B_{10} = 0,034213653$$

$$A_{11} = 774521; B_{11} = 0,0000924379$$

$$A_{12} = 7261,1; B_{12} = 0,00382939$$

$$A_{13} = 321,624; B_{13} = 0,000035612775$$

$$A_{14} = 1447,6396; B_{14} = 0,92577$$

$$A_{15} = 23397,25; B_{15} = 0,0013794732$$

$$A_{16} = 144,349; B_{16} = 0,0000453312$$

$$A_{17} = 975611; B_{17} = 0,000071882$$

$$A_{18} = 7759,3; B_{18} = 0,00004996121$$

$$A_{19} = 89,57213; B_{19} = 0,0000485225$$

$$A_{20} = 3459,59; B_{20} = 0,000294726$$

$$A_{21} = 212,49633; B_{21} = 0,000182425$$

$$A_{22} = 213593,6; B_{22} = 0,000471919$$

$$A_{23} = 26,96564; B_{23} = 0,368959$$

$$A_{24} = 989924,6; B_{24} = 0,86953$$

$$A_{25} = 56,597; B_{25} = 0,00588337$$

$$A_{26} = 19686,3; B_{26} = 0,00689946$$

$$A_{27} = 23,665566; B_{27} = 0,0000573295$$

$$A_{28} = 84262,765; B_{28} = 0,002721265$$

$$A_{29} = 71,785154; B_{29} = 0,00037556899$$

$$A_{30} = 5895,8; B_{30} = 0,0289551$$

$$A_{31} = 133,298; B_{31} = 0,0066425$$

$A_{32} = 44598,837; B_{32} = 0,0000692297$
 $A_{33} = 78422,7; B_{33} = 0,0255167$
 $A_{34} = 7249,98; B_{34} = 0,000614337$
 $A_{35} = 543373,8; B_{35} = 0,48266379$
 $A_{36} = 561,34587; B_{36} = 0,000046967$
 $A_{37} = 254899,34; B_{37} = 0,00005726164$
 $A_{38} = 36984,973; B_{38} = 0,00012683338$
 $A_{39} = 3972,3; B_{39} = 0,0024788414$
 $A_{40} = 36,12515; B_{40} = 0,78749122$
 $A_{41} = 4613,28; B_{41} = 0,00068442$
 $A_{42} = 854156; B_{42} = 0,000077992162$
 $A_{43} = 167,59; B_{43} = 0,48468$
 $A_{44} = 745299,6; B_{44} = 0,09364686$
 $A_{45} = 18,357; B_{45} = 0,811295$
 $A_{46} = 69,9634; B_{46} = 0,027411294$
 $A_{47} = 639439; B_{47} = 0,0008731272$
 $A_{48} = 7318,7287; B_{48} = 0,00032847935$
 $A_{49} = 29,3163; B_{49} = 0,0000463786$
 $A_{50} = 185,876; B_{50} = 0,084981$
 $A_{51} = 861,76; B_{51} = 0,004154284$
 $A_{52} = 6759,41; B_{52} = 0,536151$
 $A_{53} = 5372,39; B_{53} = 0,061657$
 $A_{54} = 151373,3; B_{54} = 0,00729113$
 $A_{55} = 997,631; B_{55} = 0,0683377$
 $A_{56} = 47875,443; B_{56} = 0,000774477$
 $A_{57} = 3257,285; B_{57} = 0,08862676$
 $A_{58} = 5195,5; B_{58} = 0,00723215$
 $A_{59} = 89,439264; B_{59} = 0,775731$
 $A_{60} = 819742; B_{60} = 0,0072973981$
 $A_{61} = 4237,2; B_{61} = 0,000422112$
 $A_{62} = 15594,884; B_{62} = 0,0069922236$
 $A_{63} = 639,53971; B_{63} = 0,005914292$
 $A_{64} = 846,621; B_{64} = 0,002614373$
 $A_{65} = 51246,1; B_{65} = 0,82988$
 $A_{66} = 625,5651; B_{66} = 0,000893163$

$A_{67} = 34871,92; B_{67} = 0,0008195766$
 $A_{68} = 4171,16; B_{68} = 0,0033125$
 $A_{69} = 42624,9; B_{69} = 0,06359845$
 $A_{70} = 654,42; B_{70} = 0,0000447618$
 $A_{71} = 488,855; B_{71} = 0,00094511174$
 $A_{72} = 58475,8; B_{72} = 0,14559$
 $A_{73} = 2685,6772; B_{73} = 0,00056571$
 $A_{74} = 87,59419; B_{74} = 0,71161762$
 $A_{75} = 654818,83; B_{75} = 0,0002619561$
 $A_{76} = 158,58; B_{76} = 0,087675744$
 $A_{77} = 15488,6; B_{77} = 0,65692$
 $A_{78} = 4812,22; B_{78} = 0,041687$
 $A_{79} = 7923,53; B_{79} = 0,378339$
 $A_{80} = 44,655; B_{80} = 0,00916194$
 $A_{81} = 39956,827; B_{81} = 0,0007913113$
 $A_{82} = 6845,179; B_{82} = 0,0000692553$
 $A_{83} = 92,31959; B_{83} = 0,000882835$
 $A_{84} = 6631,2; B_{84} = 0,0959766$
 $A_{85} = 944274,5; B_{85} = 0,0000331136$
 $A_{86} = 26,986452; B_{86} = 0,021445$
 $A_{87} = 5118,56; B_{87} = 0,000073827$
 $A_{88} = 94,79737; B_{88} = 0,0031149$
 $A_{89} = 8146,73; B_{89} = 0,037536717$
 $A_{90} = 1286,684; B_{90} = 0,000116655$
 $A_{91} = 1557,135; B_{91} = 0,000781983$
 $A_{92} = 7868,7245; B_{92} = 0,0000718359$
 $A_{93} = 48973,464; B_{93} = 0,0000517688$
 $A_{94} = 424,73226; B_{94} = 0,029974663$
 $A_{95} = 42477,96; B_{95} = 0,0008134633$
 $A_{96} = 2552,5; B_{96} = 0,0011945588$
 $A_{97} = 319,94514; B_{97} = 0,000623844$
 $A_{98} = 98,23398; B_{98} = 0,0041127$
 $A_{99} = 76893,5; B_{99} = 0,7127657$
 $A_{100} = 88,363; B_{100} = 0,0934935$

2 Задание II

II. Даны число A_i с верными цифрами в записи.

1. Округлить до n_i значащих цифр.

2. Найти абсолютную и относительную ошибку округления.

3. Сформировать предельную абсолютную и относительную погрешности округления.

$$A_1 = 592,41839; n_1 = 5;$$

$$A_2 = 86,8941; n_2 = 2;$$

$$A_3 = 158,76; n_3 = 2;$$

$$A_4 = 13175,928; n_4 = 4;$$

$$A_5 = 347348,32; n_5 = 4;$$

$$A_6 = 7483,4; n_6 = 2;$$

$$A_7 = 367125,6; n_7 = 6;$$

$$A_8 = 167864; n_8 = 2;$$

$$A_9 = 161,216; n_9 = 5;$$

$$A_{10} = 274,32; n_{10} = 1;$$

$$A_{11} = 4791,354; n_{11} = 4;$$

$$A_{12} = 334996,2; n_{12} = 5;$$

$$A_{13} = 44,7279; n_{13} = 4;$$

$$A_{14} = 459,29848; n_{14} = 4;$$

$$A_{15} = 687,5377; n_{15} = 3;$$

$$A_{16} = 33,4683; n_{16} = 4;$$

$$A_{17} = 13,7956; n_{17} = 5;$$

$$A_{18} = 421365,3; n_{18} = 5;$$

$$A_{19} = 177452; n_{19} = 4;$$

$$A_{20} = 437929,3; n_{20} = 2;$$

$$A_{21} = 61138,2; n_{21} = 1;$$

$$A_{22} = 193532; n_{22} = 1;$$

$$A_{23} = 43561,2; n_{23} = 4;$$

$$A_{24} = 42961,447; n_{24} = 4;$$

$$A_{25} = 692,5778; n_{25} = 5;$$

$$A_{26} = 2339,725; n_{26} = 3;$$

$$A_{27} = 947,3293; n_{27} = 4;$$

$$A_{28} = 44349,4; n_{28} = 3;$$

$A_{29} = 129,93997; n_{29} = 6;$
 $A_{30} = 171882,9; n_{30} = 5;$
 $A_{31} = 77,593; n_{31} = 2;$
 $A_{32} = 612168,6; n_{32} = 4;$
 $A_{33} = 572134,8; n_{33} = 5;$
 $A_{34} = 554,85345; n_{34} = 6;$
 $A_{35} = 294,726; n_{35} = 5;$
 $A_{36} = 321,2496; n_{36} = 3;$
 $A_{37} = 82,4255; n_{37} = 5;$
 $A_{38} = 213,5936; n_{38} = 5;$
 $A_{39} = 9193,4272; n_{39} = 6;$
 $A_{40} = 5643,6; n_{40} = 2;$
 $A_{41} = 94,4919; n_{41} = 3;$
 $A_{42} = 24686,95; n_{42} = 3;$
 $A_{43} = 3956,59; n_{43} = 3;$
 $A_{44} = 83,378119; n_{44} = 7;$
 $A_{45} = 86,368994; n_{45} = 7;$
 $A_{46} = 292366,5; n_{46} = 4;$
 $A_{47} = 57,329; n_{47} = 2;$
 $A_{48} = 238426,2; n_{48} = 4;$
 $A_{49} = 272126,53; n_{49} = 7;$
 $A_{50} = 717,85154; n_{50} = 4;$
 $A_{51} = 568995,7; n_{51} = 2;$
 $A_{52} = 895,828; n_{52} = 4;$
 $A_{53} = 14,64213; n_{53} = 3;$
 $A_{54} = 86642,525; n_{54} = 7;$
 $A_{55} = 4598,83; n_{55} = 5;$
 $A_{56} = 2297,1; n_{56} = 3;$
 $A_{57} = 78422,7; n_{57} = 3;$
 $A_{58} = 16,774277; n_{58} = 6;$
 $A_{59} = 986143,3; n_{59} = 5;$
 $A_{60} = 38543,3; n_{60} = 4;$
 $A_{61} = 4826,6; n_{61} = 2;$
 $A_{62} = 38675,613; n_{62} = 4;$
 $A_{63} = 746967,35; n_{63} = 6;$

$A_{64} = 54899,34; n_{64} = 4;$
 $A_{65} = 61645,1; n_{65} = 3;$
 $A_{66} = 69,849731; n_{66} = 5;$
 $A_{67} = 33381,2; n_{67} = 3;$
 $A_{68} = 9723,2478; n_{68} = 6;$
 $A_{69} = 42,4933; n_{69} = 3;$
 $A_{70} = 5157,87; n_{70} = 5;$
 $A_{71} = 2264,32; n_{71} = 5;$
 $A_{72} = 32868,44; n_{72} = 5;$
 $A_{73} = 5285,4156; n_{73} = 5;$
 $A_{74} = 9216,2; n_{74} = 1;$
 $A_{75} = 616,759; n_{75} = 5;$
 $A_{76} = 68172,3; n_{76} = 2;$
 $A_{77} = 2996,9; n_{77} = 4;$
 $A_{78} = 6869,364; n_{78} = 4;$
 $A_{79} = 57,8112; n_{79} = 5;$
 $A_{80} = 1446,9963; n_{80} = 5;$
 $A_{81} = 41,129; n_{81} = 1;$
 $A_{82} = 53639,4; n_{82} = 4;$
 $A_{83} = 731272; n_{83} = 2;$
 $A_{84} = 9731,8; n_{84} = 1;$
 $A_{85} = 732847; n_{85} = 4;$
 $A_{86} = 27652,93; n_{86} = 3;$
 $A_{87} = 463786,9; n_{87} = 3;$
 $A_{88} = 18587,6; n_{88} = 5;$
 $A_{89} = 814,26; n_{89} = 3;$
 $A_{90} = 17641,54; n_{90} = 3;$
 $A_{91} = 284,4675; n_{91} = 4;$
 $A_{92} = 5361,51; n_{92} = 3;$
 $A_{93} = 8537,23; n_{93} = 4;$
 $A_{94} = 65,7987; n_{94} = 5;$
 $A_{95} = 137337; n_{95} = 2;$
 $A_{96} = 135748,9; n_{96} = 3;$
 $A_{97} = 3168,33; n_{97} = 4;$
 $A_{98} = 895,4787; n_{98} = 6;$

$$A_{99} = 37744,7; n_{99} = 1;$$

$$A_{100} = 323257; n_{100} = 4;$$

3 Задание III

III. Числа A_i и B_i имеют относительные погрешности равные $\delta_A\%$ и $\delta_B\%$ соответственно. Указать верные значащие цифры.

$$A_1 = 418,39387; B_1 = 0,00868941$$

$$\delta_A = 0,004\%; \delta_B = 10\%$$

$$A_2 = 769,63131; B_2 = 0,7592843$$

$$\delta_A = 7\%; \delta_B = 0,7\%$$

$$A_3 = 832,6627; B_3 = 0,004834855$$

$$\delta_A = 0,003\%; \delta_B = 0,009\%$$

$$A_4 = 65,561678; B_4 = 0,0000647431$$

$$\delta_A = 0,8\%; \delta_B = 0,04\%$$

$$A_5 = 69274,323; B_5 = 0,294791$$

$$\delta_A = 0,001\%; \delta_B = 0,009\%$$

$$A_6 = 33,499627; B_6 = 0,734472$$

$$\delta_A = 0,06\%; \delta_B = 2\%$$

$$A_7 = 59,2984; B_7 = 0,000882468753$$

$$\delta_A = 0,06\%; \delta_B = 0,04\%$$

$$A_8 = 34683,87; B_8 = 0,09137956$$

$$\delta_A = 0,2\%; \delta_B = 1\%$$

$$A_9 = 365365,7; B_9 = 0,00177452192$$

$$\delta_A = 4\%; \delta_B = 0,009\%$$

$$A_{10} = 38726,1; B_{10} = 0,0138293$$

$$\delta_A = 8\%; \delta_B = 0,6\%$$

$$A_{11} = 21,6243; B_{11} = 0,0005612775$$

$$\delta_A = 0,09\%; \delta_B = 6\%$$

$$A_{12} = 4763,96925; B_{12} = 0,778896$$

$$\delta_A = 0,004\%; \delta_B = 1\%$$

$$A_{13} = 51,379473; B_{13} = 0,00293381443$$

$$\delta_A = 0,3\%; \delta_B = 0,5\%$$

$$A_{14} = 12993,9975; B_{14} = 0,006117188$$

$$\delta_A = 0,002\%; \delta_B = 0,006\%$$

$$A_{15} = 75,93499; B_{15} = 0,00612168$$

$$\delta_A = 0,05\%; \delta_B = 0,08\%$$

$$A_{16} = 213485,2; B_{16} = 0,255485$$

$\delta_A = 1\%; \delta_B = 0,005\%$
 $A_{17} = 29,4726; B_{17} = 0,0089632124$
 $\delta_A = 0,02\%; \delta_B = 5\%$
 $A_{18} = 24255,49; B_{18} = 0,002213593$
 $\delta_A = 0,007\%; \delta_B = 0,08\%$
 $A_{19} = 934272,696; B_{19} = 0,005643689$
 $\delta_A = 0,008\%; \delta_B = 6\%$
 $A_{20} = 989924,6; B_{20} = 0,86953973$
 $\delta_A = 0,03\%; \delta_B = 0,9\%$
 $A_{21} = 58833,781; B_{21} = 0,00191968636$
 $\delta_A = 0,003\%; \delta_B = 9\%$
 $A_{22} = 22,9236; B_{22} = 0,006556657$
 $\delta_A = 0,006\%; \delta_B = 0,8\%$
 $A_{23} = 238426,2; B_{23} = 0,000076527212$
 $\delta_A = 0,06\%; \delta_B = 6\%$
 $A_{24} = 7178,51543; B_{24} = 0,0000755689$
 $\delta_A = 9\%; \delta_B = 0,1\%$
 $A_{25} = 8958,28955; B_{25} = 0,00146421$
 $\delta_A = 0,001\%; \delta_B = 0,07\%$
 $A_{26} = 642525,334; B_{26} = 0,0459883$
 $\delta_A = 0,3\%; \delta_B = 0,06\%$
 $A_{27} = 7177,278; B_{27} = 0,0422725516$
 $\delta_A = 0,007\%; \delta_B = 0,4\%$
 $A_{28} = 249,98614; B_{28} = 0,003371238$
 $\delta_A = 7\%; \delta_B = 9\%$
 $A_{29} = 8482,66379; B_{29} = 0,0003867561$
 $\delta_A = 0,08\%; \delta_B = 6\%$
 $A_{30} = 6967,35512; B_{30} = 0,5489934$
 $\delta_A = 0,02\%; \delta_B = 10\%$
 $A_{31} = 45127,36; B_{31} = 0,00098497312$
 $\delta_A = 0,004\%; \delta_B = 0,009\%$
 $A_{32} = 12,6639723; B_{32} = 0,0247884$
 $\delta_A = 0,08\%; \delta_B = 0,1\%$
 $A_{33} = 361251,5; B_{33} = 0,000787491$
 $\delta_A = 0,02\%; \delta_B = 0,003\%$

$A_{34} = 461,328684; B_{34} = 0,004217528$
 $\delta_A = 0,008\%; \delta_B = 0,04\%$
 $A_{35} = 79,921625; B_{35} = 0,00047616759$
 $\delta_A = 8\%; \delta_B = 0,2\%$
 $A_{36} = 72374,529; B_{36} = 0,009693646$
 $\delta_A = 0,09\%; \delta_B = 0,5\%$
 $A_{37} = 1835,781; B_{37} = 0,1295514$
 $\delta_A = 8\%; \delta_B = 0,08\%$
 $A_{38} = 42741,1294; B_{38} = 0,0125363$
 $\delta_A = 7\%; \delta_B = 3\%$
 $A_{39} = 312,72513; B_{39} = 0,0973187$
 $\delta_A = 0,04\%; \delta_B = 0,7\%$
 $A_{40} = 479352,765; B_{40} = 0,0293163463$
 $\delta_A = 4\%; \delta_B = 0,05\%$
 $A_{41} = 51858,768; B_{41} = 0,0049814265$
 $\delta_A = 0,06\%; \delta_B = 0,01\%$
 $A_{42} = 1542,84284; B_{42} = 0,0000467594153$
 $\delta_A = 0,9\%; \delta_B = 0,008\%$
 $A_{43} = 28537,2; B_{43} = 0,000396165$
 $\delta_A = 7\%; \delta_B = 6\%$
 $A_{44} = 51373,372; B_{44} = 0,9113574$
 $\delta_A = 10\%; \delta_B = 0,02\%$
 $A_{45} = 168,337; B_{45} = 0,7889547$
 $\delta_A = 0,006\%; \delta_B = 0,002\%$
 $A_{46} = 7744,7793; B_{46} = 0,323257$
 $\delta_A = 0,5\%; \delta_B = 5\%$
 $A_{47} = 26,7627575; B_{47} = 0,00001955723$
 $\delta_A = 0,5\%; \delta_B = 0,06\%$
 $A_{48} = 38943,9264; B_{48} = 0,00007757311$
 $\delta_A = 7\%; \delta_B = 9\%$
 $A_{49} = 7427,29739; B_{49} = 0,0818786$
 $\delta_A = 0,007\%; \delta_B = 0,007\%$
 $A_{50} = 22,11245; B_{50} = 0,00381559$
 $\delta_A = 0,003\%; \delta_B = 0,001\%$
 $A_{51} = 922236,4; B_{51} = 0,621639$

$\delta_A = 0,007\%$; $\delta_B = 0,1\%$
 $A_{52} = 914292,2$; $B_{52} = 0,00002398466$
 $\delta_A = 0,006\%$; $\delta_B = 8\%$
 $A_{53} = 37,371215$; $B_{53} = 0,0012461829$
 $\delta_A = 0,6\%$; $\delta_B = 2\%$
 $A_{54} = 6255,65189$; $B_{54} = 0,0316318$
 $\delta_A = 6\%$; $\delta_B = 0,01\%$
 $A_{55} = 192819,5$; $B_{55} = 0,0007661156$
 $\delta_A = 0,09\%$; $\delta_B = 0,7\%$
 $A_{56} = 331251,15$; $B_{56} = 0,742624963$
 $\delta_A = 0,009\%$; $\delta_B = 0,06\%$
 $A_{57} = 39565,442$; $B_{57} = 0,447618$
 $\delta_A = 0,007\%$; $\delta_B = 0,005\%$
 $A_{58} = 885,5945$; $B_{58} = 0,000111747246$
 $\delta_A = 0,07\%$; $\delta_B = 5\%$
 $A_{59} = 14559,7375$; $B_{59} = 0,0268567$
 $\delta_A = 0,002\%$; $\delta_B = 0,3\%$
 $A_{60} = 1114,9875$; $B_{60} = 0,000941971161$
 $\delta_A = 0,007\%$; $\delta_B = 0,4\%$
 $A_{61} = 56548,188$; $B_{61} = 0,326195$
 $\delta_A = 8\%$; $\delta_B = 1\%$
 $A_{62} = 1585,88$; $B_{62} = 0,000767574472$
 $\delta_A = 0,04\%$; $\delta_B = 6\%$
 $A_{63} = 8665,69$; $B_{63} = 0,0236254812$
 $\delta_A = 0,007\%$; $\delta_B = 0,05\%$
 $A_{64} = 76637,792$; $B_{64} = 0,000353378$
 $\delta_A = 0,003\%$; $\delta_B = 0,008\%$
 $A_{65} = 5446,559$; $B_{65} = 0,0016194772$
 $\delta_A = 10\%$; $\delta_B = 0,009\%$
 $A_{66} = 82,7791311$; $B_{66} = 0,039841684$
 $\delta_A = 9\%$; $\delta_B = 0,1\%$
 $A_{67} = 25539,91$; $B_{67} = 0,0492319598$
 $\delta_A = 0,03\%$; $\delta_B = 0,05\%$
 $A_{68} = 34,3663129$; $B_{68} = 0,00005976622$
 $\delta_A = 0,8\%$; $\delta_B = 0,06\%$

$A_{69} = 745,331; B_{69} = 0,136678$
 $\delta_A = 0,04\%; \delta_B = 0,06\%$
 $A_{70} = 452214,457; B_{70} = 0,0000585511856$
 $\delta_A = 3\%; \delta_B = 0,02\%$
 $A_{71} = 632947,9; B_{71} = 0,0007373114$
 $\delta_A = 2\%; \delta_B = 3\%$
 $A_{72} = 14673,3; B_{72} = 0,007536717$
 $\delta_A = 0,004\%; \delta_B = 0,07\%$
 $A_{73} = 8668,4116; B_{73} = 0,0006558648$
 $\delta_A = 0,05\%; \delta_B = 10\%$
 $A_{74} = 5781,98327; B_{74} = 0,46786872$
 $\delta_A = 0,007\%; \delta_B = 0,4\%$
 $A_{75} = 598757,4; B_{75} = 0,0000897346$
 $\delta_A = 4\%; \delta_B = 6\%$
 $A_{76} = 8242,64; B_{76} = 0,24732262$
 $\delta_A = 3\%; \delta_B = 0,004\%$
 $A_{77} = 33,161424; B_{77} = 0,0779681$
 $\delta_A = 0,003\%; \delta_B = 5\%$
 $A_{78} = 156255,2; B_{78} = 0,051194558$
 $\delta_A = 0,004\%; \delta_B = 8\%$
 $A_{79} = 19945,1; B_{79} = 0,000462384495$
 $\delta_A = 8\%; \delta_B = 0,009\%$
 $A_{80} = 398,4112; B_{80} = 0,00766227$
 $\delta_A = 0,03\%; \delta_B = 0,02\%$
 $A_{81} = 12765,73; B_{81} = 0,0328883$
 $\delta_A = 0,03\%; \delta_B = 0,006\%$
 $A_{82} = 356911,7; B_{82} = 0,00004848449$
 $\delta_A = 6\%; \delta_B = 9\%$
 $A_{83} = 8822,21; B_{83} = 0,5437752$
 $\delta_A = 0,003\%; \delta_B = 0,002\%$
 $A_{84} = 447692,3; B_{84} = 0,18563122$
 $\delta_A = 0,01\%; \delta_B = 0,2\%$
 $A_{85} = 59839,58; B_{85} = 0,000048759555$
 $\delta_A = 2\%; \delta_B = 10\%$
 $A_{86} = 163,6653; B_{86} = 0,64587871$

$\delta_A = 9\%; \delta_B = 0,06\%$
 $A_{87} = 1178,9524; B_{87} = 0,000735497117$
 $\delta_A = 0,06\%; \delta_B = 0,6\%$
 $A_{88} = 51292,5; B_{88} = 0,000183487446$
 $\delta_A = 0,2\%; \delta_B = 0,3\%$
 $A_{89} = 44,1588; B_{89} = 0,000331796148$
 $\delta_A = 0,09\%; \delta_B = 0,07\%$
 $A_{90} = 97831,6; B_{90} = 0,063298622$
 $\delta_A = 0,05\%; \delta_B = 0,3\%$
 $A_{91} = 65,4466; B_{91} = 0,993427$
 $\delta_A = 0,5\%; \delta_B = 0,004\%$
 $A_{92} = 28,96568; B_{92} = 0,648451592$
 $\delta_A = 0,04\%; \delta_B = 7\%$
 $A_{93} = 96362,5913; B_{93} = 0,7369649$
 $\delta_A = 0,007\%; \delta_B = 5\%$
 $A_{94} = 336,378913; B_{94} = 0,00007146348$
 $\delta_A = 0,08\%; \delta_B = 0,3\%$
 $A_{95} = 3988,142; B_{95} = 0,0055629993$
 $\delta_A = 0,001\%; \delta_B = 0,06\%$
 $A_{96} = 8927,18; B_{96} = 0,00122713119$
 $\delta_A = 0,05\%; \delta_B = 8\%$
 $A_{97} = 971727,8; B_{97} = 0,0075985979$
 $\delta_A = 0,03\%; \delta_B = 10\%$
 $A_{98} = 496642,18; B_{98} = 0,0000451847474$
 $\delta_A = 4\%; \delta_B = 0,01\%$
 $A_{99} = 681479,4; B_{99} = 0,00054368328$
 $\delta_A = 0,008\%; \delta_B = 0,009\%$
 $A_{100} = 5144,98484; B_{100} = 0,00872945$
 $\delta_A = 0,004\%; \delta_B = 0,003\%$

4 Задание IV

IV. С каким минимальным числом десятичных цифр n_F, n_Y и n_Z необходимо записать значения функций F_i, Y_i и Z_i , чтобы погрешность не превышала δ_F, δ_Y и δ_Z соответственно.

$$\begin{aligned}F_1 &= \frac{189}{740}, \delta_F \leq 0,079\% \\Y_1 &= \lg 8553, \delta_Y \leq 5,9\% \\Z_1 &= \log_9 72518, \delta_Z \leq 6,3\% \\F_2 &= \frac{293}{395}, \delta_F \leq 0,022\% \\Y_2 &= \lg 3676, \delta_Y \leq 0,17\% \\Z_2 &= 838^2, \delta_Z \leq 1,9\% \\F_3 &= \frac{693}{326}, \delta_F \leq 3,6\% \\Y_3 &= 511^2, \delta_Y \leq 9,5\% \\Z_3 &= \log_7 11434, \delta_Z \leq 0,4\% \\F_4 &= \frac{672}{695}, \delta_F \leq 0,058\% \\Y_4 &= \sin(723), \delta_Y \leq 3,8\% \\Z_4 &= \log_7 5688, \delta_Z \leq 6\% \\F_5 &= \frac{137}{50}, \delta_F \leq 4,3\% \\Y_5 &= \log_9 901, \delta_Y \leq 0,065\% \\Z_5 &= \sin(706), \delta_Z \leq 0,49\% \\F_6 &= \frac{552}{649}, \delta_F \leq 0,024\% \\Y_6 &= \lg 6601, \delta_Y \leq 0,085\% \\Z_6 &= \sin(531), \delta_Z \leq 0,55\% \\F_7 &= \frac{472}{651}, \delta_F \leq 2,4\% \\Y_7 &= \sin(918), \delta_Y \leq 0,38\% \\Z_7 &= 382^2, \delta_Z \leq 3,9\% \\F_8 &= \frac{838}{147}, \delta_F \leq 0,4\% \\Y_8 &= 130^2, \delta_Y \leq 5,9\% \\Z_8 &= \lg 4361, \delta_Z \leq 0,5\% \\F_9 &= \frac{951}{92}, \delta_F \leq 7,1\% \\Y_9 &= \lg 2274, \delta_Y \leq 0,3\% \\Z_9 &= \sqrt[2]{261,7}, \delta_Z \leq 0,078\% \\F_{10} &= \frac{679}{590}, \delta_F \leq 0,32\% \\Y_{10} &= \sqrt[6]{841,8}, \delta_Y \leq 0,053\%\end{aligned}$$

$$\begin{aligned}
Z_{10} &= \log_4 77172, \delta_Z \leq 0,051\% \\
F_{11} &= \frac{607}{429}, \delta_F \leq 0,047\% \\
Y_{11} &= \log_8 52109, \delta_Y \leq 0,7\% \\
Z_{11} &= \sin(410), \delta_Z \leq 0,31\% \\
F_{12} &= \frac{623}{46}, \delta_F \leq 0,003\% \\
Y_{12} &= 336^2, \delta_Y \leq 0,051\% \\
Z_{12} &= \log_4 98165, \delta_Z \leq 0,092\% \\
F_{13} &= \frac{290}{739}, \delta_F \leq 0,054\% \\
Y_{13} &= \sin(138), \delta_Y \leq 1\% \\
Z_{13} &= 700^2, \delta_Z \leq 0,019\% \\
F_{14} &= \frac{908}{673}, \delta_F \leq 8,4\% \\
Y_{14} &= \sin(910), \delta_Y \leq 0,08\% \\
Z_{14} &= \log_5 56948, \delta_Z \leq 0,022\% \\
F_{15} &= \frac{255}{536}, \delta_F \leq 0,057\% \\
Y_{15} &= \lg 3486, \delta_Y \leq 9,9\% \\
Z_{15} &= \sqrt[3]{402,1}, \delta_Z \leq 0,004\% \\
F_{16} &= \frac{589}{344}, \delta_F \leq 0,4\% \\
Y_{16} &= \sqrt[2]{418,7}, \delta_Y \leq 4,9\% \\
Z_{16} &= \sin(996), \delta_Z \leq 0,001\% \\
F_{17} &= \frac{38}{185}, \delta_F \leq 0,073\% \\
Y_{17} &= \sin(692), \delta_Y \leq 2,3\% \\
Z_{17} &= \lg 3099, \delta_Z \leq 3,9\% \\
F_{18} &= \frac{835}{911}, \delta_F \leq 5,7\% \\
Y_{18} &= \sin(934), \delta_Y \leq 0,12\% \\
Z_{18} &= \lg 3859, \delta_Z \leq 0,003\% \\
F_{19} &= \frac{899}{163}, \delta_F \leq 0,45\% \\
Y_{19} &= \log_4 79119, \delta_Y \leq 1,7\% \\
Z_{19} &= \lg 9921, \delta_Z \leq 8,2\% \\
F_{20} &= \frac{513}{25}, \delta_F \leq 0,7\% \\
Y_{20} &= \log_6 52357, \delta_Y \leq 0,62\% \\
Z_{20} &= \sqrt[4]{485,8}, \delta_Z \leq 8,9\% \\
F_{21} &= \frac{781}{842}, \delta_F \leq 0,033\% \\
Y_{21} &= \lg 1699, \delta_Y \leq 7\% \\
Z_{21} &= \log_5 94551, \delta_Z \leq 0,055\% \\
F_{22} &= \frac{176}{79}, \delta_F \leq 0,19\%
\end{aligned}$$

$$\begin{aligned}
Y_{22} &= \lg 2694, \delta_Y \leq 0,54\% \\
Z_{22} &= \log_9 39675, \delta_Z \leq 4\% \\
F_{23} &= \frac{437}{315}, \delta_F \leq 0,6\% \\
Y_{23} &= \sqrt[3]{634,7}, \delta_Y \leq 0,89\% \\
Z_{23} &= \log_7 33616, \delta_Z \leq 0,083\% \\
F_{24} &= \frac{913}{819}, \delta_F \leq 0,033\% \\
Y_{24} &= \sqrt[3]{521,2}, \delta_Y \leq 4,6\% \\
Z_{24} &= \sin(346), \delta_Z \leq 0,14\% \\
F_{25} &= \frac{149}{220}, \delta_F \leq 0,23\% \\
Y_{25} &= \log_8 94633, \delta_Y \leq 3\% \\
Z_{25} &= \lg 9394, \delta_Z \leq 0,062\% \\
F_{26} &= \frac{479}{51}, \delta_F \leq 0,069\% \\
Y_{26} &= 105^2, \delta_Y \leq 1,9\% \\
Z_{26} &= \sqrt[2]{291,6}, \delta_Z \leq 0,88\% \\
F_{27} &= \frac{419}{324}, \delta_F \leq 0,025\% \\
Y_{27} &= \sqrt[3]{459,8}, \delta_Y \leq 3,5\% \\
Z_{27} &= \log_3 37879, \delta_Z \leq 0,075\% \\
F_{28} &= \frac{671}{210}, \delta_F \leq 0,86\% \\
Y_{28} &= \sqrt[3]{527,6}, \delta_Y \leq 0,03\% \\
Z_{28} &= \sin(599), \delta_Z \leq 0,081\% \\
F_{29} &= \frac{545}{926}, \delta_F \leq 2,4\% \\
Y_{29} &= \log_9 53528, \delta_Y \leq 7,3\% \\
Z_{29} &= \sqrt[3]{492,8}, \delta_Z \leq 0,62\% \\
F_{30} &= \frac{731}{786}, \delta_F \leq 9,7\% \\
Y_{30} &= \log_9 94546, \delta_Y \leq 0,68\% \\
Z_{30} &= \lg 6462, \delta_Z \leq 0,086\% \\
F_{31} &= \frac{489}{683}, \delta_F \leq 0,094\% \\
Y_{31} &= \log_6 70297, \delta_Y \leq 0,52\% \\
Z_{31} &= \lg 6062, \delta_Z \leq 8,5\% \\
F_{32} &= \frac{781}{172}, \delta_F \leq 0,01\% \\
Y_{32} &= \sqrt[5]{887,4}, \delta_Y \leq 0,083\% \\
Z_{32} &= \lg 5753, \delta_Z \leq 8,7\% \\
F_{33} &= \frac{909}{977}, \delta_F \leq 0,24\% \\
Y_{33} &= \sin(761), \delta_Y \leq 9,7\% \\
Z_{33} &= \sqrt[3]{225,5}, \delta_Z \leq 0,38\%
\end{aligned}$$

$$\begin{aligned}
F_{34} &= \frac{125}{36}, \delta_F \leq 2,7\% \\
Y_{34} &= \sqrt[5]{447,4}, \delta_Y \leq 1,2\% \\
Z_{34} &= \log_5 3841, \delta_Z \leq 0,72\% \\
F_{35} &= \frac{843}{931}, \delta_F \leq 0,014\% \\
Y_{35} &= \lg 4775, \delta_Y \leq 0,059\% \\
Z_{35} &= \log_7 47035, \delta_Z \leq 0,79\% \\
F_{36} &= \frac{135}{902}, \delta_F \leq 0,002\% \\
Y_{36} &= \log_3 10547, \delta_Y \leq 0,051\% \\
Z_{36} &= \sin(904), \delta_Z \leq 0,061\% \\
F_{37} &= \frac{79}{380}, \delta_F \leq 2,4\% \\
Y_{37} &= \sqrt[4]{826,7}, \delta_Y \leq 0,086\% \\
Z_{37} &= \lg 7774, \delta_Z \leq 0,57\% \\
F_{38} &= \frac{647}{123}, \delta_F \leq 0,18\% \\
Y_{38} &= 741^2, \delta_Y \leq 0,097\% \\
Z_{38} &= \lg 3997, \delta_Z \leq 0,86\% \\
F_{39} &= \frac{319}{885}, \delta_F \leq 0,054\% \\
Y_{39} &= 134^2, \delta_Y \leq 0,63\% \\
Z_{39} &= \log_7 32978, \delta_Z \leq 8,5\% \\
F_{40} &= \frac{912}{647}, \delta_F \leq 0,68\% \\
Y_{40} &= \log_5 11421, \delta_Y \leq 0,049\% \\
Z_{40} &= \sin(475), \delta_Z \leq 0,76\% \\
F_{41} &= \frac{221}{815}, \delta_F \leq 0,51\% \\
Y_{41} &= 301^2, \delta_Y \leq 9,9\% \\
Z_{41} &= \sqrt[3]{234,9}, \delta_Z \leq 0,08\% \\
F_{42} &= \frac{995}{187}, \delta_F \leq 0,6\% \\
Y_{42} &= 681^2, \delta_Y \leq 0,063\% \\
Z_{42} &= \lg 2134, \delta_Z \leq 0,049\% \\
F_{43} &= \frac{908}{445}, \delta_F \leq 7,9\% \\
Y_{43} &= \sqrt[2]{173,6}, \delta_Y \leq 5,3\% \\
Z_{43} &= \log_6 70823, \delta_Z \leq 0,44\% \\
F_{44} &= \frac{61}{515}, \delta_F \leq 0,86\% \\
Y_{44} &= \log_9 14358, \delta_Y \leq 0,91\% \\
Z_{44} &= \sqrt[6]{544,9}, \delta_Z \leq 9,8\% \\
F_{45} &= \frac{204}{613}, \delta_F \leq 0,065\% \\
Y_{45} &= \sqrt[3]{475,8}, \delta_Y \leq 0,82\%
\end{aligned}$$

$$\begin{aligned}
Z_{45} &= 592^2, \delta_Z \leq 0,004\% \\
F_{46} &= \frac{586}{587}, \delta_F \leq 0,28\% \\
Y_{46} &= \log_8 71432, \delta_Y \leq 0,68\% \\
Z_{46} &= 515^2, \delta_Z \leq 0,42\% \\
F_{47} &= \frac{850}{607}, \delta_F \leq 9,3\% \\
Y_{47} &= \sin(428), \delta_Y \leq 0,6\% \\
Z_{47} &= \log_9 8658, \delta_Z \leq 7,1\% \\
F_{48} &= \frac{194}{517}, \delta_F \leq 4,1\% \\
Y_{48} &= \log_6 28417, \delta_Y \leq 0,65\% \\
Z_{48} &= 850^2, \delta_Z \leq 0,043\% \\
F_{49} &= \frac{120}{259}, \delta_F \leq 0,085\% \\
Y_{49} &= \sqrt[4]{513,6}, \delta_Y \leq 0,49\% \\
Z_{49} &= 945^2, \delta_Z \leq 7,2\% \\
F_{50} &= \frac{697}{771}, \delta_F \leq 6,3\% \\
Y_{50} &= \log_5 85056, \delta_Y \leq 0,2\% \\
Z_{50} &= \lg 1105, \delta_Z \leq 0,86\% \\
F_{51} &= \frac{793}{931}, \delta_F \leq 0,004\% \\
Y_{51} &= \log_4 38556, \delta_Y \leq 0,024\% \\
Z_{51} &= \sqrt[5]{388,1}, \delta_Z \leq 2,8\% \\
F_{52} &= \frac{909}{161}, \delta_F \leq 0,091\% \\
Y_{52} &= \log_6 36787, \delta_Y \leq 0,5\% \\
Z_{52} &= 135^2, \delta_Z \leq 4,4\% \\
F_{53} &= \frac{46}{863}, \delta_F \leq 0,3\% \\
Y_{53} &= \lg 8797, \delta_Y \leq 0,25\% \\
Z_{53} &= \sqrt[2]{655,9}, \delta_Z \leq 0,49\% \\
F_{54} &= \frac{376}{33}, \delta_F \leq 0,05\% \\
Y_{54} &= \lg 3243, \delta_Y \leq 0,97\% \\
Z_{54} &= \sqrt[5]{942,3}, \delta_Z \leq 8,5\% \\
F_{55} &= \frac{437}{712}, \delta_F \leq 2,7\% \\
Y_{55} &= \sin(493), \delta_Y \leq 0,13\% \\
Z_{55} &= \log_6 44168, \delta_Z \leq 0,76\% \\
F_{56} &= \frac{960}{869}, \delta_F \leq 0,083\% \\
Y_{56} &= \lg 1107, \delta_Y \leq 0,56\% \\
Z_{56} &= \log_5 20064, \delta_Z \leq 0,016\% \\
F_{57} &= \frac{466}{23}, \delta_F \leq 0,063\%
\end{aligned}$$

$$\begin{aligned}
Y_{57} &= 203^2, \delta_Y \leq 0,034\% \\
Z_{57} &= \sin(534), \delta_Z \leq 0,055\% \\
F_{58} &= \frac{149}{136}, \delta_F \leq 0,018\% \\
Y_{58} &= \sin(728), \delta_Y \leq 0,014\% \\
Z_{58} &= \lg 2805, \delta_Z \leq 0,1\% \\
F_{59} &= \frac{680}{673}, \delta_F \leq 1\% \\
Y_{59} &= \sqrt[3]{748,5}, \delta_Y \leq 0,3\% \\
Z_{59} &= \lg 3041, \delta_Z \leq 6,2\% \\
F_{60} &= \frac{389}{882}, \delta_F \leq 0,6\% \\
Y_{60} &= \sin(671), \delta_Y \leq 0,09\% \\
Z_{60} &= \lg 9157, \delta_Z \leq 0,2\% \\
F_{61} &= \frac{944}{57}, \delta_F \leq 0,11\% \\
Y_{61} &= \log_9 95398, \delta_Y \leq 6,2\% \\
Z_{61} &= \sqrt[3]{169,5}, \delta_Z \leq 3,5\% \\
F_{62} &= \frac{291}{133}, \delta_F \leq 0,016\% \\
Y_{62} &= \sqrt[2]{439,9}, \delta_Y \leq 5,6\% \\
Z_{62} &= \lg 3423, \delta_Z \leq 0,016\% \\
F_{63} &= \frac{799}{389}, \delta_F \leq 0,16\% \\
Y_{63} &= \sqrt[3]{879,2}, \delta_Y \leq 0,52\% \\
Z_{63} &= 798^2, \delta_Z \leq 4,2\% \\
F_{64} &= \frac{151}{986}, \delta_F \leq 0,9\% \\
Y_{64} &= \sin(441), \delta_Y \leq 0,014\% \\
Z_{64} &= \log_8 84835, \delta_Z \leq 0,09\% \\
F_{65} &= \frac{887}{996}, \delta_F \leq 0,72\% \\
Y_{65} &= \sqrt[7]{895,3}, \delta_Y \leq 3,4\% \\
Z_{65} &= \lg 4969, \delta_Z \leq 0,068\% \\
F_{66} &= \frac{698}{691}, \delta_F \leq 0,081\% \\
Y_{66} &= \sin(667), \delta_Y \leq 1,7\% \\
Z_{66} &= 728^2, \delta_Z \leq 5\% \\
F_{67} &= \frac{414}{835}, \delta_F \leq 1,7\% \\
Y_{67} &= 866^2, \delta_Y \leq 0,017\% \\
Z_{67} &= \lg 9419, \delta_Z \leq 0,27\% \\
F_{68} &= \frac{736}{71}, \delta_F \leq 1\% \\
Y_{68} &= \lg 4143, \delta_Y \leq 0,016\% \\
Z_{68} &= \log_6 88612, \delta_Z \leq 0,3\%
\end{aligned}$$

$$\begin{aligned}
F_{69} &= \frac{657}{139}, \delta_F \leq 0,1\% \\
Y_{69} &= \log_8 54269, \delta_Y \leq 0,85\% \\
Z_{69} &= \lg 6183, \delta_Z \leq 0,57\% \\
F_{70} &= \frac{747}{734}, \delta_F \leq 0,096\% \\
Y_{70} &= \lg 1381, \delta_Y \leq 0,53\% \\
Z_{70} &= 166^2, \delta_Z \leq 0,07\% \\
F_{71} &= \frac{515}{218}, \delta_F \leq 6,3\% \\
Y_{71} &= 422^2, \delta_Y \leq 3,4\% \\
Z_{71} &= \sin(346), \delta_Z \leq 0,59\% \\
F_{72} &= \frac{609}{838}, \delta_F \leq 0,99\% \\
Y_{72} &= \log_8 28297, \delta_Y \leq 3,1\% \\
Z_{72} &= \sqrt[2]{515,4}, \delta_Z \leq 0,93\% \\
F_{73} &= \frac{865}{843}, \delta_F \leq 3,1\% \\
Y_{73} &= \log_3 70005, \delta_Y \leq 5\% \\
Z_{73} &= \lg 1558, \delta_Z \leq 0,26\% \\
F_{74} &= \frac{723}{973}, \delta_F \leq 0,89\% \\
Y_{74} &= \lg 2557, \delta_Y \leq 0,07\% \\
Z_{74} &= 575^2, \delta_Z \leq 3,9\% \\
F_{75} &= \frac{248}{583}, \delta_F \leq 0,006\% \\
Y_{75} &= \sqrt[2]{761,6}, \delta_Y \leq 0,65\% \\
Z_{75} &= \sin(949), \delta_Z \leq 0,058\% \\
F_{76} &= \frac{955}{379}, \delta_F \leq 3,4\% \\
Y_{76} &= 937^2, \delta_Y \leq 0,26\% \\
Z_{76} &= \sqrt[6]{437,1}, \delta_Z \leq 0,11\% \\
F_{77} &= \frac{745}{193}, \delta_F \leq 0,092\% \\
Y_{77} &= \sin(805), \delta_Y \leq 0,5\% \\
Z_{77} &= \lg 5749, \delta_Z \leq 3,6\% \\
F_{78} &= \frac{634}{599}, \delta_F \leq 0,082\% \\
Y_{78} &= 473^2, \delta_Y \leq 0,86\% \\
Z_{78} &= \sqrt[4]{194,4}, \delta_Z \leq 0,53\% \\
F_{79} &= \frac{256}{655}, \delta_F \leq 0,075\% \\
Y_{79} &= \lg 5915, \delta_Y \leq 2\% \\
Z_{79} &= \log_3 50658, \delta_Z \leq 0,044\% \\
F_{80} &= \frac{910}{91}, \delta_F \leq 0,01\% \\
Y_{80} &= 673^2, \delta_Y \leq 0,001\%
\end{aligned}$$

$$\begin{aligned}
Z_{80} &= \lg 5212, \delta_Z \leq 0,96\% \\
F_{81} &= \frac{295}{446}, \delta_F \leq 0,011\% \\
Y_{81} &= \sin(779), \delta_Y \leq 2,3\% \\
Z_{81} &= \lg 3225, \delta_Z \leq 0,75\% \\
F_{82} &= \frac{875}{366}, \delta_F \leq 0,3\% \\
Y_{82} &= \sqrt[2]{772,2}, \delta_Y \leq 0,056\% \\
Z_{82} &= 122^2, \delta_Z \leq 6,1\% \\
F_{83} &= \frac{631}{226}, \delta_F \leq 9,5\% \\
Y_{83} &= \log_8 89227, \delta_Y \leq 0,51\% \\
Z_{83} &= 612^2, \delta_Z \leq 0,44\% \\
F_{84} &= \frac{241}{771}, \delta_F \leq 0,035\% \\
Y_{84} &= \log_3 6655, \delta_Y \leq 0,05\% \\
Z_{84} &= \sin(667), \delta_Z \leq 0,087\% \\
F_{85} &= \frac{6}{451}, \delta_F \leq 2,2\% \\
Y_{85} &= \log_4 23831, \delta_Y \leq 8,4\% \\
Z_{85} &= \lg 8065, \delta_Z \leq 0,23\% \\
F_{86} &= \frac{329}{493}, \delta_F \leq 0,78\% \\
Y_{86} &= \log_5 61889, \delta_Y \leq 0,07\% \\
Z_{86} &= \lg 6788, \delta_Z \leq 4,4\% \\
F_{87} &= \frac{551}{518}, \delta_F \leq 8,6\% \\
Y_{87} &= \lg 4132, \delta_Y \leq 3,9\% \\
Z_{87} &= \log_8 42906, \delta_Z \leq 3,8\% \\
F_{88} &= \frac{493}{288}, \delta_F \leq 0,014\% \\
Y_{88} &= 372^2, \delta_Y \leq 9,4\% \\
Z_{88} &= \lg 3103, \delta_Z \leq 0,035\% \\
F_{89} &= \frac{703}{379}, \delta_F \leq 0,82\% \\
Y_{89} &= \log_7 79595, \delta_Y \leq 0,091\% \\
Z_{89} &= \sqrt[2]{810,4}, \delta_Z \leq 0,24\% \\
F_{90} &= \frac{261}{221}, \delta_F \leq 6,1\% \\
Y_{90} &= \sin(142), \delta_Y \leq 8,4\% \\
Z_{90} &= \lg 3827, \delta_Z \leq 8,7\% \\
F_{91} &= \frac{890}{949}, \delta_F \leq 0,082\% \\
Y_{91} &= \lg 7884, \delta_Y \leq 5,8\% \\
Z_{91} &= \sin(963), \delta_Z \leq 5,1\% \\
F_{92} &= \frac{299}{509}, \delta_F \leq 3,6\%
\end{aligned}$$

$$\begin{aligned}
Y_{92} &= \lg 9369, \delta_Y \leq 0,066\% \\
Z_{92} &= \log_5 3283, \delta_Z \leq 7,6\% \\
F_{93} &= \frac{830}{611}, \delta_F \leq 0,38\% \\
Y_{93} &= \lg 6923, \delta_Y \leq 9,3\% \\
Z_{93} &= \sqrt[4]{408,1}, \delta_Z \leq 0,83\% \\
F_{94} &= \frac{677}{38}, \delta_F \leq 0,42\% \\
Y_{94} &= \log_5 34134, \delta_Y \leq 0,9\% \\
Z_{94} &= \sqrt[7]{300,1}, \delta_Z \leq 0,1\% \\
F_{95} &= \frac{601}{944}, \delta_F \leq 0,45\% \\
Y_{95} &= \sqrt[7]{125,6}, \delta_Y \leq 0,041\% \\
Z_{95} &= \log_4 1235, \delta_Z \leq 8,8\% \\
F_{96} &= \frac{529}{788}, \delta_F \leq 3\% \\
Y_{96} &= 991^2, \delta_Y \leq 0,041\% \\
Z_{96} &= \sqrt[2]{710,5}, \delta_Z \leq 0,6\% \\
F_{97} &= \frac{3}{287}, \delta_F \leq 0,074\% \\
Y_{97} &= \sin(897), \delta_Y \leq 0,094\% \\
Z_{97} &= 426^2, \delta_Z \leq 0,21\% \\
F_{98} &= \frac{589}{592}, \delta_F \leq 0,06\% \\
Y_{98} &= \lg 1497, \delta_Y \leq 0,019\% \\
Z_{98} &= \sqrt[2]{108,5}, \delta_Z \leq 0,09\% \\
F_{99} &= \frac{640}{211}, \delta_F \leq 0,075\% \\
Y_{99} &= \sin(219), \delta_Y \leq 2,3\% \\
Z_{99} &= \log_8 63305, \delta_Z \leq 0,012\% \\
F_{100} &= \frac{959}{820}, \delta_F \leq 0,63\% \\
Y_{100} &= \log_3 80696, \delta_Y \leq 0,97\% \\
Z_{100} &= \lg 5476, \delta_Z \leq 0,61\% \\
F_{101} &= \frac{679}{242}, \delta_F \leq 8,3\% \\
Y_{101} &= \log_9 66511, \delta_Y \leq 0,05\% \\
Z_{101} &= \lg 3981, \delta_Z \leq 2,4\%
\end{aligned}$$

5 Задание V

V. Задана функция $F = F(a, b, c, d)$. Требуется найти абсолютную и относительную погрешности вычислений этой функции в заданной точке (a, b, c, d) . Абсолютные погрешности аргументов заданы.

Решить двумя способами: используя основную формулу теории погрешностей.

с помощью метода границ.

$$F_1 = \sin(a) - c + 6^b + d$$

$$a_1 = 8,741 \pm 0,257;$$

$$b_1 = 7,316 \pm 0,205;$$

$$c_1 = 7,842 \pm 0,286;$$

$$d_1 = 7,40 \pm 0,254;$$

$$F_2 = \log_b(d) - c \times \sqrt[5]{a}$$

$$a_2 = 7,977 \pm 0,284;$$

$$b_2 = 6,386 \pm 0,272;$$

$$c_2 = 6,924 \pm 0,284;$$

$$d_2 = 7,829 \pm 0,212;$$

$$F_3 = \frac{10^{d-a}}{10^{c-b}}$$

$$a_3 = 5,966 \pm 0,297;$$

$$b_3 = 8,191 \pm 0,229;$$

$$c_3 = 6,457 \pm 0,266;$$

$$d_3 = 6,383 \pm 0,298;$$

$$F_4 = d^7 - a - b^7 - c$$

$$a_4 = 6,999 \pm 0,257;$$

$$b_4 = 7,900 \pm 0,251;$$

$$c_4 = 8,467 \pm 0,292;$$

$$d_4 = 6,648 \pm 0,261;$$

$$F_5 = \sin(b) + c \times 7^a + d$$

$$a_5 = 8,600 \pm 0,298;$$

$$b_5 = 8,556 \pm 0,273;$$

$$c_5 = 8,224 \pm 0,300;$$

$$d_5 = 5,609 \pm 0,241;$$

$$F_6 = 3^b + d \times a - c$$

$$\begin{aligned}
a_6 &= 6,488 \pm 0,221; \\
b_6 &= 8,734 \pm 0,235; \\
c_6 &= 6,316 \pm 0,267; \\
d_6 &= 7,263 \pm 0,271; \\
F_7 &= \log_c(d) - \cos(a) - b \\
a_7 &= 7,480 \pm 0,224; \\
b_7 &= 8,802 \pm 0,259; \\
c_7 &= 8,625 \pm 0,228; \\
d_7 &= 5,23 \pm 0,276; \\
F_8 &= d + b + 3^a - c \\
a_8 &= 8,624 \pm 0,242; \\
b_8 &= 6,576 \pm 0,280; \\
c_8 &= 7,302 \pm 0,300; \\
d_8 &= 7,678 \pm 0,270; \\
F_9 &= b^c \times \sin(a) - d \\
a_9 &= 8,758 \pm 0,294; \\
b_9 &= 6,882 \pm 0,217; \\
c_9 &= 6,487 \pm 0,285; \\
d_9 &= 7,625 \pm 0,274; \\
F_{10} &= \frac{d-a}{b \times \cos(c)} \\
a_{10} &= 6,589 \pm 0,233; \\
b_{10} &= 6,353 \pm 0,223; \\
c_{10} &= 8,740 \pm 0,226; \\
d_{10} &= 7,335 \pm 0,273; \\
F_{11} &= b^{10} + d \times c + a \\
a_{11} &= 7,205 \pm 0,226; \\
b_{11} &= 8,303 \pm 0,209; \\
c_{11} &= 7,247 \pm 0,250; \\
d_{11} &= 5,971 \pm 0,288; \\
F_{12} &= \sin(a) - d + c^4 + b \\
a_{12} &= 7,853 \pm 0,276; \\
b_{12} &= 5,748 \pm 0,226; \\
c_{12} &= 8,257 \pm 0,221; \\
d_{12} &= 5,955 \pm 0,288; \\
F_{13} &= a^c - \sin(d) - b
\end{aligned}$$

$$\begin{aligned}
a_{13} &= 7,259 \pm 0,220; \\
b_{13} &= 8,971 \pm 0,206; \\
c_{13} &= 6,781 \pm 0,242; \\
d_{13} &= 5,685 \pm 0,263; \\
F_{14} &= d^3 + c - \cos(b) + a \\
a_{14} &= 6,132 \pm 0,260; \\
b_{14} &= 6,113 \pm 0,209; \\
c_{14} &= 6,790 \pm 0,206; \\
d_{14} &= 8,28 \pm 0,235; \\
F_{15} &= 4^c + a - b^4 - d \\
a_{15} &= 5,679 \pm 0,287; \\
b_{15} &= 6,405 \pm 0,239; \\
c_{15} &= 5,516 \pm 0,252; \\
d_{15} &= 7,87 \pm 0,207; \\
F_{16} &= a - b \times \sin(c) + d \\
a_{16} &= 8,806 \pm 0,247; \\
b_{16} &= 7,602 \pm 0,292; \\
c_{16} &= 8,481 \pm 0,202; \\
d_{16} &= 5,630 \pm 0,276; \\
F_{17} &= b^8 - d - c \times \cos(a) \\
a_{17} &= 5,281 \pm 0,215; \\
b_{17} &= 5,373 \pm 0,269; \\
c_{17} &= 7,876 \pm 0,291; \\
d_{17} &= 5,572 \pm 0,288; \\
F_{18} &= \sin(d) + b - c - a \\
a_{18} &= 5,830 \pm 0,255; \\
b_{18} &= 7,177 \pm 0,240; \\
c_{18} &= 7,702 \pm 0,222; \\
d_{18} &= 6,590 \pm 0,236; \\
F_{19} &= a + b + c + d \\
a_{19} &= 7,599 \pm 0,220; \\
b_{19} &= 5,982 \pm 0,256; \\
c_{19} &= 5,369 \pm 0,235; \\
d_{19} &= 7,608 \pm 0,261; \\
F_{20} &= \sin(d) + a \times c \times \lg b
\end{aligned}$$

$$\begin{aligned}
a_{20} &= 8,780 \pm 0,255; \\
b_{20} &= 8,544 \pm 0,207; \\
c_{20} &= 8,899 \pm 0,202; \\
d_{20} &= 8,538 \pm 0,218; \\
F_{21} &= 10^d + a + \cos(b) + c \\
a_{21} &= 8,971 \pm 0,286; \\
b_{21} &= 6,193 \pm 0,204; \\
c_{21} &= 6,826 \pm 0,267; \\
d_{21} &= 7,582 \pm 0,244; \\
F_{22} &= \sin(b) + d \times a + c \\
a_{22} &= 7,579 \pm 0,210; \\
b_{22} &= 6,750 \pm 0,269; \\
c_{22} &= 6,81 \pm 0,266; \\
d_{22} &= 7,676 \pm 0,279; \\
F_{23} &= \frac{a \times \sin(c)}{d^5 - b} \\
a_{23} &= 7,666 \pm 0,202; \\
b_{23} &= 8,28 \pm 0,221; \\
c_{23} &= 5,253 \pm 0,261; \\
d_{23} &= 5,503 \pm 0,254; \\
F_{24} &= b \times \sqrt[10]{d} \times 10^c + a \\
a_{24} &= 8,267 \pm 0,204; \\
b_{24} &= 5,186 \pm 0,264; \\
c_{24} &= 5,827 \pm 0,297; \\
d_{24} &= 8,152 \pm 0,272; \\
F_{25} &= d^5 + c + \log_a(b) \\
a_{25} &= 5,315 \pm 0,204; \\
b_{25} &= 6,9 \pm 0,295; \\
c_{25} &= 5,455 \pm 0,277; \\
d_{25} &= 8,742 \pm 0,221; \\
F_{26} &= a \times \sqrt[8]{b} \times \sin(c) - d \\
a_{26} &= 8,556 \pm 0,257; \\
b_{26} &= 8,44 \pm 0,289; \\
c_{26} &= 8,388 \pm 0,228; \\
d_{26} &= 7,319 \pm 0,210; \\
F_{27} &= 4^b - a - \cos(d) - c
\end{aligned}$$

$$\begin{aligned}
a_{27} &= 7,760 \pm 0,230; \\
b_{27} &= 8,481 \pm 0,211; \\
c_{27} &= 8,493 \pm 0,213; \\
d_{27} &= 6,746 \pm 0,234; \\
F_{28} &= b^2 + d + a \times \cos(c) \\
a_{28} &= 6,255 \pm 0,278; \\
b_{28} &= 7,401 \pm 0,204; \\
c_{28} &= 8,393 \pm 0,246; \\
d_{28} &= 6,792 \pm 0,233; \\
F_{29} &= \frac{\cos(b)+c}{\sin(d)+a} \\
a_{29} &= 6,704 \pm 0,271; \\
b_{29} &= 6,308 \pm 0,244; \\
c_{29} &= 5,792 \pm 0,243; \\
d_{29} &= 5,469 \pm 0,293; \\
F_{30} &= \cos(a) - c \times d^7 - b \\
a_{30} &= 7,651 \pm 0,200; \\
b_{30} &= 8,83 \pm 0,277; \\
c_{30} &= 7,250 \pm 0,201; \\
d_{30} &= 8,381 \pm 0,250; \\
F_{31} &= \sin(c) + d \times \log_b(a) \\
a_{31} &= 6,778 \pm 0,264; \\
b_{31} &= 8,520 \pm 0,300; \\
c_{31} &= 6,134 \pm 0,282; \\
d_{31} &= 8,336 \pm 0,273; \\
F_{32} &= b \times \sin(c) + d^7 + a \\
a_{32} &= 5,761 \pm 0,215; \\
b_{32} &= 8,729 \pm 0,238; \\
c_{32} &= 5,451 \pm 0,276; \\
d_{32} &= 5,570 \pm 0,286; \\
F_{33} &= \log_d(a) \times c^b \\
a_{33} &= 7,620 \pm 0,231; \\
b_{33} &= 5,964 \pm 0,265; \\
c_{33} &= 7,693 \pm 0,261; \\
d_{33} &= 8,0 \pm 0,292; \\
F_{34} &= \log_b(c) \times a^6 + d
\end{aligned}$$

$$\begin{aligned}
a_{34} &= 5,123 \pm 0,298; \\
b_{34} &= 8,461 \pm 0,260; \\
c_{34} &= 7,369 \pm 0,220; \\
d_{34} &= 5,179 \pm 0,279; \\
F_{35} &= d \times \sin(b) \times \log_a(c) \\
a_{35} &= 8,47 \pm 0,257; \\
b_{35} &= 5,311 \pm 0,234; \\
c_{35} &= 6,53 \pm 0,200; \\
d_{35} &= 5,740 \pm 0,207; \\
F_{36} &= 4^d - b + \sin(a) + c \\
a_{36} &= 5,400 \pm 0,294; \\
b_{36} &= 5,154 \pm 0,227; \\
c_{36} &= 7,831 \pm 0,285; \\
d_{36} &= 6,623 \pm 0,245; \\
F_{37} &= d \times \cos(b) \times \cos(a) - c \\
a_{37} &= 5,731 \pm 0,250; \\
b_{37} &= 5,557 \pm 0,207; \\
c_{37} &= 5,170 \pm 0,297; \\
d_{37} &= 7,301 \pm 0,262; \\
F_{38} &= b \times \lg d + c + a \\
a_{38} &= 8,149 \pm 0,246; \\
b_{38} &= 8,503 \pm 0,283; \\
c_{38} &= 8,537 \pm 0,249; \\
d_{38} &= 8,651 \pm 0,207; \\
F_{39} &= \log_a(b) \times d \times \sqrt[6]{c} \\
a_{39} &= 7,97 \pm 0,219; \\
b_{39} &= 8,406 \pm 0,266; \\
c_{39} &= 6,651 \pm 0,224; \\
d_{39} &= 5,743 \pm 0,265; \\
F_{40} &= a \times \lg d \times 5^b - c \\
a_{40} &= 8,53 \pm 0,297; \\
b_{40} &= 6,146 \pm 0,274; \\
c_{40} &= 5,854 \pm 0,274; \\
d_{40} &= 8,206 \pm 0,270; \\
F_{41} &= \frac{d \times \lg c}{a+b}
\end{aligned}$$

$$\begin{aligned}
a_{41} &= 5,893 \pm 0,230; \\
b_{41} &= 8,844 \pm 0,252; \\
c_{41} &= 6,200 \pm 0,246; \\
d_{41} &= 6,325 \pm 0,249; \\
F_{42} &= a \times \cos(b) - 8^d + c \\
a_{42} &= 8,813 \pm 0,260; \\
b_{42} &= 7,476 \pm 0,211; \\
c_{42} &= 8,429 \pm 0,242; \\
d_{42} &= 7,531 \pm 0,246; \\
F_{43} &= a \times \sqrt[5]{d} - \sin(c) - b \\
a_{43} &= 8,26 \pm 0,225; \\
b_{43} &= 8,774 \pm 0,256; \\
c_{43} &= 5,546 \pm 0,214; \\
d_{43} &= 6,714 \pm 0,250; \\
F_{44} &= \frac{d \times \cos(a)}{c^b} \\
a_{44} &= 7,438 \pm 0,295; \\
b_{44} &= 8,242 \pm 0,275; \\
c_{44} &= 7,631 \pm 0,223; \\
d_{44} &= 8,781 \pm 0,283; \\
F_{45} &= a + b + \sin(c) - d \\
a_{45} &= 7,859 \pm 0,284; \\
b_{45} &= 5,172 \pm 0,206; \\
c_{45} &= 6,683 \pm 0,229; \\
d_{45} &= 8,976 \pm 0,233; \\
F_{46} &= b^c - d^3 - a \\
a_{46} &= 6,370 \pm 0,203; \\
b_{46} &= 7,359 \pm 0,271; \\
c_{46} &= 7,391 \pm 0,223; \\
d_{46} &= 7,591 \pm 0,211; \\
F_{47} &= \frac{\sin(c) - a}{d + b} \\
a_{47} &= 7,971 \pm 0,258; \\
b_{47} &= 8,174 \pm 0,289; \\
c_{47} &= 8,658 \pm 0,224; \\
d_{47} &= 7,983 \pm 0,270; \\
F_{48} &= d + a \times 10^c - b
\end{aligned}$$

$$\begin{aligned}
a_{48} &= 5,976 \pm 0,299; \\
b_{48} &= 7,189 \pm 0,282; \\
c_{48} &= 8,301 \pm 0,288; \\
d_{48} &= 5,523 \pm 0,277; \\
F_{49} &= a \times \sqrt[8]{c} \times b + d \\
a_{49} &= 7,787 \pm 0,236; \\
b_{49} &= 6,942 \pm 0,268; \\
c_{49} &= 6,815 \pm 0,206; \\
d_{49} &= 6,388 \pm 0,279; \\
F_{50} &= b + d - \sin(c) + a \\
a_{50} &= 8,454 \pm 0,237; \\
b_{50} &= 5,357 \pm 0,272; \\
c_{50} &= 5,829 \pm 0,292; \\
d_{50} &= 6,405 \pm 0,263; \\
F_{51} &= a - b - \sin(d) + c \\
a_{51} &= 5,854 \pm 0,274; \\
b_{51} &= 7,16 \pm 0,202; \\
c_{51} &= 6,945 \pm 0,234; \\
d_{51} &= 8,521 \pm 0,282; \\
F_{52} &= 10^b - a + c^{10} + d \\
a_{52} &= 8,135 \pm 0,275; \\
b_{52} &= 7,271 \pm 0,221; \\
c_{52} &= 5,877 \pm 0,205; \\
d_{52} &= 8,686 \pm 0,280; \\
F_{53} &= 6^d + b + \cos(c) + a \\
a_{53} &= 6,370 \pm 0,285; \\
b_{53} &= 5,77 \pm 0,240; \\
c_{53} &= 8,573 \pm 0,259; \\
d_{53} &= 8,731 \pm 0,244; \\
F_{54} &= c^9 - d + \log_a(b) \\
a_{54} &= 8,941 \pm 0,261; \\
b_{54} &= 6,539 \pm 0,207; \\
c_{54} &= 8,99 \pm 0,221; \\
d_{54} &= 6,726 \pm 0,300; \\
F_{55} &= 9^b - a + \sin(c) - d
\end{aligned}$$

$$\begin{aligned}
a_{55} &= 5,771 \pm 0,246; \\
b_{55} &= 7,57 \pm 0,261; \\
c_{55} &= 7,670 \pm 0,215; \\
d_{55} &= 6,148 \pm 0,216; \\
F_{56} &= d + a - c^b \\
a_{56} &= 6,655 \pm 0,278; \\
b_{56} &= 7,582 \pm 0,239; \\
c_{56} &= 7,24 \pm 0,294; \\
d_{56} &= 8,337 \pm 0,224; \\
F_{57} &= \sin(d) + b + c \times \cos(a) \\
a_{57} &= 7,429 \pm 0,212; \\
b_{57} &= 8,153 \pm 0,232; \\
c_{57} &= 7,41 \pm 0,213; \\
d_{57} &= 8,720 \pm 0,246; \\
F_{58} &= a^7 + b - \sin(d) + c \\
a_{58} &= 6,986 \pm 0,207; \\
b_{58} &= 8,140 \pm 0,282; \\
c_{58} &= 5,485 \pm 0,266; \\
d_{58} &= 8,161 \pm 0,279; \\
F_{59} &= \frac{\cos(b)-d}{a+c} \\
a_{59} &= 5,60 \pm 0,205; \\
b_{59} &= 8,309 \pm 0,295; \\
c_{59} &= 8,300 \pm 0,256; \\
d_{59} &= 5,140 \pm 0,249; \\
F_{60} &= d + a - \sin(c) - b \\
a_{60} &= 5,848 \pm 0,263; \\
b_{60} &= 5,565 \pm 0,242; \\
c_{60} &= 6,175 \pm 0,280; \\
d_{60} &= 7,147 \pm 0,291; \\
F_{61} &= a^8 + c - \sin(d) - b \\
a_{61} &= 6,881 \pm 0,215; \\
b_{61} &= 5,898 \pm 0,261; \\
c_{61} &= 7,694 \pm 0,234; \\
d_{61} &= 8,500 \pm 0,247; \\
F_{62} &= d \times \sin(a) - \log_c(b)
\end{aligned}$$

$$\begin{aligned}
a_{62} &= 5,194 \pm 0,283; \\
b_{62} &= 7,745 \pm 0,260; \\
c_{62} &= 6,149 \pm 0,206; \\
d_{62} &= 5,401 \pm 0,250; \\
F_{63} &= b^4 - c \times d + a \\
a_{63} &= 6,915 \pm 0,239; \\
b_{63} &= 6,74 \pm 0,223; \\
c_{63} &= 7,546 \pm 0,271; \\
d_{63} &= 8,233 \pm 0,228; \\
F_{64} &= \cos(a) + b - 5^d - c \\
a_{64} &= 8,857 \pm 0,274; \\
b_{64} &= 6,322 \pm 0,254; \\
c_{64} &= 7,702 \pm 0,256; \\
d_{64} &= 7,152 \pm 0,212; \\
F_{65} &= \cos(a) + d + b^c \\
a_{65} &= 5,818 \pm 0,259; \\
b_{65} &= 5,910 \pm 0,280; \\
c_{65} &= 5,728 \pm 0,220; \\
d_{65} &= 6,277 \pm 0,211; \\
F_{66} &= \sin(d) - a + \sin(c) - b \\
a_{66} &= 7,729 \pm 0,275; \\
b_{66} &= 8,769 \pm 0,226; \\
c_{66} &= 6,676 \pm 0,270; \\
d_{66} &= 6,161 \pm 0,288; \\
F_{67} &= c \times \lg b - d + a \\
a_{67} &= 7,732 \pm 0,291; \\
b_{67} &= 8,63 \pm 0,256; \\
c_{67} &= 8,740 \pm 0,286; \\
d_{67} &= 8,270 \pm 0,281; \\
F_{68} &= d \times \sqrt[3]{c} - \cos(a) + b \\
a_{68} &= 8,544 \pm 0,236; \\
b_{68} &= 5,274 \pm 0,280; \\
c_{68} &= 5,401 \pm 0,284; \\
d_{68} &= 8,828 \pm 0,230; \\
F_{69} &= c \times \sin(d) \times \cos(a) - b
\end{aligned}$$

$$\begin{aligned}
a_{69} &= 6,175 \pm 0,231; \\
b_{69} &= 5,481 \pm 0,228; \\
c_{69} &= 5,713 \pm 0,293; \\
d_{69} &= 7,806 \pm 0,241; \\
F_{70} &= c \times \sin(b) + \sin(a) - d \\
a_{70} &= 6,165 \pm 0,285; \\
b_{70} &= 6,791 \pm 0,292; \\
c_{70} &= 6,515 \pm 0,220; \\
d_{70} &= 8,388 \pm 0,273; \\
F_{71} &= a^{10} + b - d^{10} + c \\
a_{71} &= 7,336 \pm 0,226; \\
b_{71} &= 5,988 \pm 0,206; \\
c_{71} &= 6,670 \pm 0,283; \\
d_{71} &= 5,391 \pm 0,252; \\
F_{72} &= \sin(a) + c + d - b \\
a_{72} &= 8,6 \pm 0,231; \\
b_{72} &= 6,751 \pm 0,262; \\
c_{72} &= 8,228 \pm 0,268; \\
d_{72} &= 8,220 \pm 0,291; \\
F_{73} &= \log_a(d) + \sin(c) + b \\
a_{73} &= 8,301 \pm 0,275; \\
b_{73} &= 8,879 \pm 0,267; \\
c_{73} &= 8,709 \pm 0,234; \\
d_{73} &= 6,952 \pm 0,262; \\
F_{74} &= \cos(d) - a + \log_b(c) \\
a_{74} &= 7,142 \pm 0,222; \\
b_{74} &= 8,459 \pm 0,261; \\
c_{74} &= 6,301 \pm 0,261; \\
d_{74} &= 8,606 \pm 0,256; \\
F_{75} &= c \times \sin(b) \times \cos(a) - d \\
a_{75} &= 7,685 \pm 0,256; \\
b_{75} &= 6,502 \pm 0,259; \\
c_{75} &= 5,573 \pm 0,227; \\
d_{75} &= 5,811 \pm 0,208; \\
F_{76} &= \cos(d) - c + a \times \sqrt[5]{b}
\end{aligned}$$

$$\begin{aligned}
a_{76} &= 6,192 \pm 0,213; \\
b_{76} &= 8,907 \pm 0,284; \\
c_{76} &= 7,561 \pm 0,272; \\
d_{76} &= 5,251 \pm 0,208; \\
F_{77} &= 5^b + c - d^a \\
a_{77} &= 7,969 \pm 0,292; \\
b_{77} &= 8,643 \pm 0,255; \\
c_{77} &= 5,537 \pm 0,203; \\
d_{77} &= 7,911 \pm 0,223; \\
F_{78} &= b \times \lg d \times 7^a - c \\
a_{78} &= 6,205 \pm 0,280; \\
b_{78} &= 7,787 \pm 0,267; \\
c_{78} &= 6,139 \pm 0,220; \\
d_{78} &= 6,638 \pm 0,278; \\
F_{79} &= \frac{4^{d+b}}{c^a} \\
a_{79} &= 7,183 \pm 0,283; \\
b_{79} &= 5,59 \pm 0,209; \\
c_{79} &= 6,537 \pm 0,246; \\
d_{79} &= 6,923 \pm 0,278; \\
F_{80} &= d \times \sqrt[2]{b} \times \sin(c) + a \\
a_{80} &= 6,630 \pm 0,268; \\
b_{80} &= 5,413 \pm 0,252; \\
c_{80} &= 6,132 \pm 0,270; \\
d_{80} &= 6,645 \pm 0,229; \\
F_{81} &= c^7 + b + a^7 + d \\
a_{81} &= 5,684 \pm 0,261; \\
b_{81} &= 5,340 \pm 0,271; \\
c_{81} &= 7,297 \pm 0,221; \\
d_{81} &= 5,622 \pm 0,201; \\
F_{82} &= a \times \sin(d) - c^3 - b \\
a_{82} &= 6,639 \pm 0,263; \\
b_{82} &= 6,651 \pm 0,267; \\
c_{82} &= 6,576 \pm 0,216; \\
d_{82} &= 7,502 \pm 0,205; \\
F_{83} &= b^7 - a + c \times \sin(d)
\end{aligned}$$

$$\begin{aligned}
a_{83} &= 5,342 \pm 0,224; \\
b_{83} &= 6,430 \pm 0,259; \\
c_{83} &= 5,198 \pm 0,245; \\
d_{83} &= 5,405 \pm 0,271; \\
F_{84} &= \frac{\log_a(b)}{\log_c(a)} \\
a_{84} &= 7,711 \pm 0,209; \\
b_{84} &= 6,930 \pm 0,255; \\
c_{84} &= 7,448 \pm 0,218; \\
d_{84} &= 6,670 \pm 0,264; \\
F_{85} &= \cos(a) - b - \sin(d) - c \\
a_{85} &= 6,184 \pm 0,246; \\
b_{85} &= 8,746 \pm 0,294; \\
c_{85} &= 5,197 \pm 0,282; \\
d_{85} &= 8,398 \pm 0,202; \\
F_{86} &= d^a + c^b \\
a_{86} &= 7,799 \pm 0,277; \\
b_{86} &= 8,253 \pm 0,221; \\
c_{86} &= 5,785 \pm 0,281; \\
d_{86} &= 5,593 \pm 0,294; \\
F_{87} &= d \times \lg a \times c \times \cos(b) \\
a_{87} &= 7,91 \pm 0,203; \\
b_{87} &= 7,851 \pm 0,298; \\
c_{87} &= 8,852 \pm 0,200; \\
d_{87} &= 7,589 \pm 0,222; \\
F_{88} &= b + a \times 9^d - c \\
a_{88} &= 7,787 \pm 0,234; \\
b_{88} &= 8,430 \pm 0,248; \\
c_{88} &= 8,407 \pm 0,256; \\
d_{88} &= 7,205 \pm 0,202; \\
F_{89} &= \sin(b) - a \times d + c \\
a_{89} &= 6,413 \pm 0,207; \\
b_{89} &= 5,92 \pm 0,239; \\
c_{89} &= 8,807 \pm 0,295; \\
d_{89} &= 8,547 \pm 0,208; \\
F_{90} &= c^a + d^3 + b
\end{aligned}$$

$$\begin{aligned}
a_{90} &= 5,683 \pm 0,300; \\
b_{90} &= 8,756 \pm 0,205; \\
c_{90} &= 7,668 \pm 0,267; \\
d_{90} &= 8,184 \pm 0,252; \\
F_{91} &= \frac{\log_a(b)}{c^6+a} \\
a_{91} &= 8,140 \pm 0,224; \\
b_{91} &= 8,755 \pm 0,243; \\
c_{91} &= 5,445 \pm 0,243; \\
d_{91} &= 6,650 \pm 0,283; \\
F_{92} &= b \times \sin(c) + d - a \\
a_{92} &= 7,633 \pm 0,291; \\
b_{92} &= 6,636 \pm 0,293; \\
c_{92} &= 8,906 \pm 0,271; \\
d_{92} &= 6,620 \pm 0,277; \\
F_{93} &= \frac{c^b}{2^a-d} \\
a_{93} &= 7,199 \pm 0,276; \\
b_{93} &= 7,465 \pm 0,282; \\
c_{93} &= 7,78 \pm 0,295; \\
d_{93} &= 5,848 \pm 0,216; \\
F_{94} &= \cos(c) - b + d \times \cos(a) \\
a_{94} &= 7,306 \pm 0,201; \\
b_{94} &= 8,473 \pm 0,201; \\
c_{94} &= 7,336 \pm 0,275; \\
d_{94} &= 5,188 \pm 0,205; \\
F_{95} &= \frac{b+c}{6^d+a} \\
a_{95} &= 7,760 \pm 0,259; \\
b_{95} &= 8,646 \pm 0,268; \\
c_{95} &= 5,526 \pm 0,255; \\
d_{95} &= 7,649 \pm 0,277; \\
F_{96} &= 4^d + c \times b + a \\
a_{96} &= 6,924 \pm 0,286; \\
b_{96} &= 5,802 \pm 0,217; \\
c_{96} &= 8,580 \pm 0,217; \\
d_{96} &= 5,708 \pm 0,265; \\
F_{97} &= \cos(c) - d \times \sin(a) + b
\end{aligned}$$

$$\begin{aligned}
a_{97} &= 6,908 \pm 0,212; \\
b_{97} &= 5,739 \pm 0,219; \\
c_{97} &= 6,872 \pm 0,276; \\
d_{97} &= 6,772 \pm 0,237; \\
F_{98} &= c \times \cos(d) \times a \times \sin(b) \\
a_{98} &= 5,585 \pm 0,237; \\
b_{98} &= 6,653 \pm 0,209; \\
c_{98} &= 8,388 \pm 0,278; \\
d_{98} &= 7,866 \pm 0,279; \\
F_{99} &= \sin(a) + c - b \times \cos(d) \\
a_{99} &= 6,86 \pm 0,288; \\
b_{99} &= 6,763 \pm 0,243; \\
c_{99} &= 5,667 \pm 0,267; \\
d_{99} &= 7,213 \pm 0,261; \\
F_{100} &= c^3 + b \times d^a \\
a_{100} &= 5,985 \pm 0,201; \\
b_{100} &= 7,608 \pm 0,266; \\
c_{100} &= 5,401 \pm 0,280; \\
d_{100} &= 5,347 \pm 0,253; \\
F_{101} &= \frac{\log_a(b)}{d^c + c} \\
a_{101} &= 5,779 \pm 0,231; \\
b_{101} &= 8,751 \pm 0,272; \\
c_{101} &= 5,498 \pm 0,273; \\
d_{101} &= 7,306 \pm 0,253;
\end{aligned}$$

6 Задание VI

VI. Задана функция $F = F(a, b, c, d)$. С какой минимальной точностью следует задать аргументы, чтобы при вычислении функции F в точке (a, b, c, d) относительная погрешность не превосходила δ_1 .

$$F_1 = \sin(a) - c + 6^b + d$$

$$a_1 = 8,741; b_1 = 7,316; c_1 = 7,842; d_1 = 7,40; \delta_F = 0,05\%;$$

$$F_2 = \log_b(d) - c \times \sqrt[5]{a}$$

$$a_2 = 7,977;$$

$$b_2 = 6,386;$$

$$c_2 = 6,924;$$

$$d_2 = 7,829;$$

$$\delta_F = 0,04\%;$$

$$F_3 = \frac{10^d - a}{10^c - b}$$

$$a_3 = 5,966;$$

$$b_3 = 8,191;$$

$$c_3 = 6,457;$$

$$d_3 = 6,383;$$

$$\delta_F = 0,08\%;$$

$$F_4 = d^7 - a - b^7 - c$$

$$a_4 = 6,999;$$

$$b_4 = 7,900;$$

$$c_4 = 8,467;$$

$$d_4 = 6,648;$$

$$\delta_F = 0,01\%;$$

$$F_5 = \sin(b) + c \times 7^a + d$$

$$a_5 = 8,600;$$

$$b_5 = 8,556;$$

$$c_5 = 8,224;$$

$$d_5 = 5,609;$$

$$\delta_F = 0,01\%;$$

$$F_6 = 3^b + d \times a - c$$

$$a_6 = 6,488;$$

$$b_6 = 8,734;$$

$$\begin{aligned}
c_6 &= 6,316; \\
d_6 &= 7,263; \\
\delta_F &= 0,01\%; \\
F_7 &= \log_c(d) - \cos(a) - b \\
a_7 &= 7,480; \\
b_7 &= 8,802; \\
c_7 &= 8,625; \\
d_7 &= 5,23; \\
\delta_F &= 0,07\%; \\
F_8 &= d + b + 3^a - c \\
a_8 &= 8,624; \\
b_8 &= 6,576; \\
c_8 &= 7,302; \\
d_8 &= 7,678; \\
\delta_F &= 0,06\%; \\
F_9 &= b^c \times \sin(a) - d \\
a_9 &= 8,758; \\
b_9 &= 6,882; \\
c_9 &= 6,487; \\
d_9 &= 7,625; \\
\delta_F &= 0,06\%; \\
F_{10} &= \frac{d-a}{b \times \cos(c)} \\
a_{10} &= 6,589; \\
b_{10} &= 6,353; \\
c_{10} &= 8,740; \\
d_{10} &= 7,335; \\
\delta_F &= 0,01\%; \\
F_{11} &= b^{10} + d \times c + a \\
a_{11} &= 7,205; \\
b_{11} &= 8,303; \\
c_{11} &= 7,247; \\
d_{11} &= 5,971; \\
\delta_F &= 0,06\%; \\
F_{12} &= \sin(a) - d + c^4 + b \\
a_{12} &= 7,853;
\end{aligned}$$

$$\begin{aligned}
b_{12} &= 5,748; \\
c_{12} &= 8,257; \\
d_{12} &= 5,955; \\
\delta_F &= 0,05\%; \\
F_{13} &= a^c - \sin(d) - b \\
a_{13} &= 7,259; \\
b_{13} &= 8,971; \\
c_{13} &= 6,781; \\
d_{13} &= 5,685; \\
\delta_F &= 0,01\%; \\
F_{14} &= d^3 + c - \cos(b) + a \\
a_{14} &= 6,132; \\
b_{14} &= 6,113; \\
c_{14} &= 6,790; \\
d_{14} &= 8,28; \\
\delta_F &= 0,01\%; \\
F_{15} &= 4^c + a - b^4 - d \\
a_{15} &= 5,679; \\
b_{15} &= 6,405; \\
c_{15} &= 5,516; \\
d_{15} &= 7,87; \\
\delta_F &= 0,09\%; \\
F_{16} &= a - b \times \sin(c) + d \\
a_{16} &= 8,806; \\
b_{16} &= 7,602; \\
c_{16} &= 8,481; \\
d_{16} &= 5,630; \\
\delta_F &= 0,08\%; \\
F_{17} &= b^8 - d - c \times \cos(a) \\
a_{17} &= 5,281; \\
b_{17} &= 5,373; \\
c_{17} &= 7,876; \\
d_{17} &= 5,572; \\
\delta_F &= 0,06\%; \\
F_{18} &= \sin(d) + b - c - a
\end{aligned}$$

$$\begin{aligned}
a_{18} &= 5,830; \\
b_{18} &= 7,177; \\
c_{18} &= 7,702; \\
d_{18} &= 6,590; \\
\delta_F &= 0,05\%; \\
F_{19} &= a + b + c + d \\
a_{19} &= 7,599; \\
b_{19} &= 5,982; \\
c_{19} &= 5,369; \\
d_{19} &= 7,608; \\
\delta_F &= 0,09\%; \\
F_{20} &= \sin(d) + a \times c \times \lg b \\
a_{20} &= 8,780; \\
b_{20} &= 8,544; \\
c_{20} &= 8,899; \\
d_{20} &= 8,538; \\
\delta_F &= 0,02\%; \\
F_{21} &= 10^d + a + \cos(b) + c \\
a_{21} &= 8,971; \\
b_{21} &= 6,193; \\
c_{21} &= 6,826; \\
d_{21} &= 7,582; \\
\delta_F &= 0,07\%; \\
F_{22} &= \sin(b) + d \times a + c \\
a_{22} &= 7,579; \\
b_{22} &= 6,750; \\
c_{22} &= 6,81; \\
d_{22} &= 7,676; \\
\delta_F &= 0,04\%; \\
F_{23} &= \frac{a \times \sin(c)}{d^5 - b} \\
a_{23} &= 7,666; \\
b_{23} &= 8,28; \\
c_{23} &= 5,253; \\
d_{23} &= 5,503; \\
\delta_F &= 0,04\%;
\end{aligned}$$

$$\begin{aligned}
F_{24} &= b \times \sqrt[10]{d} \times 10^c + a \\
a_{24} &= 8,267; \\
b_{24} &= 5,186; \\
c_{24} &= 5,827; \\
d_{24} &= 8,152; \\
\delta_F &= 0,05\%; \\
F_{25} &= d^5 + c + \log_a(b) \\
a_{25} &= 5,315; \\
b_{25} &= 6,9; \\
c_{25} &= 5,455; \\
d_{25} &= 8,742; \\
\delta_F &= 0,06\%; \\
F_{26} &= a \times \sqrt[8]{b} \times \sin(c) - d \\
a_{26} &= 8,556; \\
b_{26} &= 8,44; \\
c_{26} &= 8,388; \\
d_{26} &= 7,319; \\
\delta_F &= 0,08\%; \\
F_{27} &= 4^b - a - \cos(d) - c \\
a_{27} &= 7,760; \\
b_{27} &= 8,481; \\
c_{27} &= 8,493; \\
d_{27} &= 6,746; \\
\delta_F &= 0,01\%; \\
F_{28} &= b^2 + d + a \times \cos(c) \\
a_{28} &= 6,255; \\
b_{28} &= 7,401; \\
c_{28} &= 8,393; \\
d_{28} &= 6,792; \\
\delta_F &= 0,06\%; \\
F_{29} &= \frac{\cos(b)+c}{\sin(d)+a} \\
a_{29} &= 6,704; \\
b_{29} &= 6,308; \\
c_{29} &= 5,792; \\
d_{29} &= 5,469;
\end{aligned}$$

$$\begin{aligned}
&\delta_F = 0,06\%; \\
&F_{30} = \cos(a) - c \times d^7 - b \\
&a_{30} = 7,651; \\
&b_{30} = 8,83; \\
&c_{30} = 7,250; \\
&d_{30} = 8,381; \\
&\delta_F = 0,05\%; \\
&F_{31} = \sin(c) + d \times \log_b(a) \\
&a_{31} = 6,778; \\
&b_{31} = 8,520; \\
&c_{31} = 6,134; \\
&d_{31} = 8,336; \\
&\delta_F = 0,02\%; \\
&F_{32} = b \times \sin(c) + d^7 + a \\
&a_{32} = 5,761; \\
&b_{32} = 8,729; \\
&c_{32} = 5,451; \\
&d_{32} = 5,570; \\
&\delta_F = 0,08\%; \\
&F_{33} = \log_d(a) \times c^b \\
&a_{33} = 7,620; \\
&b_{33} = 5,964; \\
&c_{33} = 7,693; \\
&d_{33} = 8,0; \\
&\delta_F = 0,01\%; \\
&F_{34} = \log_b(c) \times a^6 + d \\
&a_{34} = 5,123; \\
&b_{34} = 8,461; \\
&c_{34} = 7,369; \\
&d_{34} = 5,179; \\
&\delta_F = 0,07\%; \\
&F_{35} = d \times \sin(b) \times \log_a(c) \\
&a_{35} = 8,47; \\
&b_{35} = 5,311; \\
&c_{35} = 6,53;
\end{aligned}$$

$$\begin{aligned}
d_{35} &= 5,740; \\
\delta_F &= 0,03\%; \\
F_{36} &= 4^d - b + \sin(a) + c \\
a_{36} &= 5,400; \\
b_{36} &= 5,154; \\
c_{36} &= 7,831; \\
d_{36} &= 6,623; \\
\delta_F &= 0,04\%; \\
F_{37} &= d \times \cos(b) \times \cos(a) - c \\
a_{37} &= 5,731; \\
b_{37} &= 5,557; \\
c_{37} &= 5,170; \\
d_{37} &= 7,301; \\
\delta_F &= 0,05\%; \\
F_{38} &= b \times \lg d + c + a \\
a_{38} &= 8,149; \\
b_{38} &= 8,503; \\
c_{38} &= 8,537; \\
d_{38} &= 8,651; \\
\delta_F &= 0,07\%; \\
F_{39} &= \log_a(b) \times d \times \sqrt[6]{c} \\
a_{39} &= 7,97; \\
b_{39} &= 8,406; \\
c_{39} &= 6,651; \\
d_{39} &= 5,743; \\
\delta_F &= 0,08\%; \\
F_{40} &= a \times \lg d \times 5^b - c \\
a_{40} &= 8,53; \\
b_{40} &= 6,146; \\
c_{40} &= 5,854; \\
d_{40} &= 8,206; \\
\delta_F &= 0,03\%; \\
F_{41} &= \frac{d \times \lg c}{a+b} \\
a_{41} &= 5,893; \\
b_{41} &= 8,844;
\end{aligned}$$

$$\begin{aligned}
c_{41} &= 6,200; \\
d_{41} &= 6,325; \\
\delta_F &= 0,08\%; \\
F_{42} &= a \times \cos(b) - 8^d + c \\
a_{42} &= 8,813; \\
b_{42} &= 7,476; \\
c_{42} &= 8,429; \\
d_{42} &= 7,531; \\
\delta_F &= 0,02\%; \\
F_{43} &= a \times \sqrt[5]{d} - \sin(c) - b \\
a_{43} &= 8,26; \\
b_{43} &= 8,774; \\
c_{43} &= 5,546; \\
d_{43} &= 6,714; \\
\delta_F &= 0,01\%; \\
F_{44} &= \frac{d \times \cos(a)}{c^b} \\
a_{44} &= 7,438; \\
b_{44} &= 8,242; \\
c_{44} &= 7,631; \\
d_{44} &= 8,781; \\
\delta_F &= 0,06\%; \\
F_{45} &= a + b + \sin(c) - d \\
a_{45} &= 7,859; \\
b_{45} &= 5,172; \\
c_{45} &= 6,683; \\
d_{45} &= 8,976; \\
\delta_F &= 0,04\%; \\
F_{46} &= b^c - d^3 - a \\
a_{46} &= 6,370; \\
b_{46} &= 7,359; \\
c_{46} &= 7,391; \\
d_{46} &= 7,591; \\
\delta_F &= 0,02\%; \\
F_{47} &= \frac{\sin(c) - a}{d + b} \\
a_{47} &= 7,971;
\end{aligned}$$

$$\begin{aligned}
b_{47} &= 8,174; \\
c_{47} &= 8,658; \\
d_{47} &= 7,983; \\
\delta_F &= 0,01\%; \\
F_{48} &= d + a \times 10^c - b \\
a_{48} &= 5,976; \\
b_{48} &= 7,189; \\
c_{48} &= 8,301; \\
d_{48} &= 5,523; \\
\delta_F &= 0,02\%; \\
F_{49} &= a \times \sqrt[8]{c} \times b + d \\
a_{49} &= 7,787; \\
b_{49} &= 6,942; \\
c_{49} &= 6,815; \\
d_{49} &= 6,388; \\
\delta_F &= 0,07\%; \\
F_{50} &= b + d - \sin(c) + a \\
a_{50} &= 8,454; \\
b_{50} &= 5,357; \\
c_{50} &= 5,829; \\
d_{50} &= 6,405; \\
\delta_F &= 0,08\%; \\
F_{51} &= a - b - \sin(d) + c \\
a_{51} &= 5,854; \\
b_{51} &= 7,16; \\
c_{51} &= 6,945; \\
d_{51} &= 8,521; \\
\delta_F &= 0,01\%; \\
F_{52} &= 10^b - a + c^{10} + d \\
a_{52} &= 8,135; \\
b_{52} &= 7,271; \\
c_{52} &= 5,877; \\
d_{52} &= 8,686; \\
\delta_F &= 0,05\%; \\
F_{53} &= 6^d + b + \cos(c) + a
\end{aligned}$$

$$\begin{aligned}
a_{53} &= 6,370; \\
b_{53} &= 5,77; \\
c_{53} &= 8,573; \\
d_{53} &= 8,731; \\
\delta_F &= 0,08\%; \\
F_{54} &= c^9 - d + \log_a(b) \\
a_{54} &= 8,941; \\
b_{54} &= 6,539; \\
c_{54} &= 8,99; \\
d_{54} &= 6,726; \\
\delta_F &= 0,09\%; \\
F_{55} &= 9^b - a + \sin(c) - d \\
a_{55} &= 5,771; \\
b_{55} &= 7,57; \\
c_{55} &= 7,670; \\
d_{55} &= 6,148; \\
\delta_F &= 0,06\%; \\
F_{56} &= d + a - c^b \\
a_{56} &= 6,655; \\
b_{56} &= 7,582; \\
c_{56} &= 7,24; \\
d_{56} &= 8,337; \\
\delta_F &= 0,03\%; \\
F_{57} &= \sin(d) + b + c \times \cos(a) \\
a_{57} &= 7,429; \\
b_{57} &= 8,153; \\
c_{57} &= 7,41; \\
d_{57} &= 8,720; \\
\delta_F &= 0,02\%; \\
F_{58} &= a^7 + b - \sin(d) + c \\
a_{58} &= 6,986; \\
b_{58} &= 8,140; \\
c_{58} &= 5,485; \\
d_{58} &= 8,161; \\
\delta_F &= 0,09\%;
\end{aligned}$$

$$F_{59} = \frac{\cos(b)-d}{a+c}$$

$$a_{59} = 5,60;$$

$$b_{59} = 8,309;$$

$$c_{59} = 8,300;$$

$$d_{59} = 5,140;$$

$$\delta_F = 0,08\%;$$

$$F_{60} = d + a - \sin(c) - b$$

$$a_{60} = 5,848;$$

$$b_{60} = 5,565;$$

$$c_{60} = 6,175;$$

$$d_{60} = 7,147;$$

$$\delta_F = 0,04\%;$$

$$F_{61} = a^8 + c - \sin(d) - b$$

$$a_{61} = 6,881;$$

$$b_{61} = 5,898;$$

$$c_{61} = 7,694;$$

$$d_{61} = 8,500;$$

$$\delta_F = 0,02\%;$$

$$F_{62} = d \times \sin(a) - \log_c(b)$$

$$a_{62} = 5,194;$$

$$b_{62} = 7,745;$$

$$c_{62} = 6,149;$$

$$d_{62} = 5,401;$$

$$\delta_F = 0,05\%;$$

$$F_{63} = b^4 - c \times d + a$$

$$a_{63} = 6,915;$$

$$b_{63} = 6,74;$$

$$c_{63} = 7,546;$$

$$d_{63} = 8,233;$$

$$\delta_F = 0,09\%;$$

$$F_{64} = \cos(a) + b - 5^d - c$$

$$a_{64} = 8,857;$$

$$b_{64} = 6,322;$$

$$c_{64} = 7,702;$$

$$d_{64} = 7,152;$$

$$\begin{aligned}
\delta_F &= 0,01\%; \\
F_{65} &= \cos(a) + d + b^c \\
a_{65} &= 5,818; \\
b_{65} &= 5,910; \\
c_{65} &= 5,728; \\
d_{65} &= 6,277; \\
\delta_F &= 0,01\%; \\
F_{66} &= \sin(d) - a + \sin(c) - b \\
a_{66} &= 7,729; \\
b_{66} &= 8,769; \\
c_{66} &= 6,676; \\
d_{66} &= 6,161; \\
\delta_F &= 0,02\%; \\
F_{67} &= c \times \lg b - d + a \\
a_{67} &= 7,732; \\
b_{67} &= 8,63; \\
c_{67} &= 8,740; \\
d_{67} &= 8,270; \\
\delta_F &= 0,04\%; \\
F_{68} &= d \times \sqrt[3]{c} - \cos(a) + b \\
a_{68} &= 8,544; \\
b_{68} &= 5,274; \\
c_{68} &= 5,401; \\
d_{68} &= 8,828; \\
\delta_F &= 0,05\%; \\
F_{69} &= c \times \sin(d) \times \cos(a) - b \\
a_{69} &= 6,175; \\
b_{69} &= 5,481; \\
c_{69} &= 5,713; \\
d_{69} &= 7,806; \\
\delta_F &= 0,08\%; \\
F_{70} &= c \times \sin(b) + \sin(a) - d \\
a_{70} &= 6,165; \\
b_{70} &= 6,791; \\
c_{70} &= 6,515;
\end{aligned}$$

$$\begin{aligned}
d_{70} &= 8,388; \\
\delta_F &= 0,04\%; \\
F_{71} &= a^{10} + b - d^{10} + c \\
a_{71} &= 7,336; \\
b_{71} &= 5,988; \\
c_{71} &= 6,670; \\
d_{71} &= 5,391; \\
\delta_F &= 0,03\%; \\
F_{72} &= \sin(a) + c + d - b \\
a_{72} &= 8,6; \\
b_{72} &= 6,751; \\
c_{72} &= 8,228; \\
d_{72} &= 8,220; \\
\delta_F &= 0,03\%; \\
F_{73} &= \log_a(d) + \sin(c) + b \\
a_{73} &= 8,301; \\
b_{73} &= 8,879; \\
c_{73} &= 8,709; \\
d_{73} &= 6,952; \\
\delta_F &= 0,02\%; \\
F_{74} &= \cos(d) - a + \log_b(c) \\
a_{74} &= 7,142; \\
b_{74} &= 8,459; \\
c_{74} &= 6,301; \\
d_{74} &= 8,606; \\
\delta_F &= 0,05\%; \\
F_{75} &= c \times \sin(b) \times \cos(a) - d \\
a_{75} &= 7,685; \\
b_{75} &= 6,502; \\
c_{75} &= 5,573; \\
d_{75} &= 5,811; \\
\delta_F &= 0,02\%; \\
F_{76} &= \cos(d) - c + a \times \sqrt[5]{b} \\
a_{76} &= 6,192; \\
b_{76} &= 8,907;
\end{aligned}$$

$$\begin{aligned}
c_{76} &= 7,561; \\
d_{76} &= 5,251; \\
\delta_F &= 0,09\%; \\
F_{77} &= 5^b + c - d^a \\
a_{77} &= 7,969; \\
b_{77} &= 8,643; \\
c_{77} &= 5,537; \\
d_{77} &= 7,911; \\
\delta_F &= 0,09\%; \\
F_{78} &= b \times \lg d \times 7^a - c \\
a_{78} &= 6,205; \\
b_{78} &= 7,787; \\
c_{78} &= 6,139; \\
d_{78} &= 6,638; \\
\delta_F &= 0,03\%; \\
F_{79} &= \frac{4^d + b}{c^a} \\
a_{79} &= 7,183; \\
b_{79} &= 5,59; \\
c_{79} &= 6,537; \\
d_{79} &= 6,923; \\
\delta_F &= 0,08\%; \\
F_{80} &= d \times \sqrt[2]{b} \times \sin(c) + a \\
a_{80} &= 6,630; \\
b_{80} &= 5,413; \\
c_{80} &= 6,132; \\
d_{80} &= 6,645; \\
\delta_F &= 0,08\%; \\
F_{81} &= c^7 + b + a^7 + d \\
a_{81} &= 5,684; \\
b_{81} &= 5,340; \\
c_{81} &= 7,297; \\
d_{81} &= 5,622; \\
\delta_F &= 0,01\%; \\
F_{82} &= a \times \sin(d) - c^3 - b \\
a_{82} &= 6,639;
\end{aligned}$$

$$\begin{aligned}
b_{82} &= 6,651; \\
c_{82} &= 6,576; \\
d_{82} &= 7,502; \\
\delta_F &= 0,01\%; \\
F_{83} &= b^7 - a + c \times \sin(d) \\
a_{83} &= 5,342; \\
b_{83} &= 6,430; \\
c_{83} &= 5,198; \\
d_{83} &= 5,405; \\
\delta_F &= 0,06\%; \\
F_{84} &= \frac{\log_a(b)}{\log_c(a)} \\
a_{84} &= 7,711; \\
b_{84} &= 6,930; \\
c_{84} &= 7,448; \\
d_{84} &= 6,670; \\
\delta_F &= 0,01\%; \\
F_{85} &= \cos(a) - b - \sin(d) - c \\
a_{85} &= 6,184; \\
b_{85} &= 8,746; \\
c_{85} &= 5,197; \\
d_{85} &= 8,398; \\
\delta_F &= 0,06\%; \\
F_{86} &= d^a + c^b \\
a_{86} &= 7,799; \\
b_{86} &= 8,253; \\
c_{86} &= 5,785; \\
d_{86} &= 5,593; \\
\delta_F &= 0,09\%; \\
F_{87} &= d \times \lg a \times c \times \cos(b) \\
a_{87} &= 7,91; \\
b_{87} &= 7,851; \\
c_{87} &= 8,852; \\
d_{87} &= 7,589; \\
\delta_F &= 0,07\%; \\
F_{88} &= b + a \times 9^d - c
\end{aligned}$$

$$\begin{aligned}
a_{88} &= 7,787; \\
b_{88} &= 8,430; \\
c_{88} &= 8,407; \\
d_{88} &= 7,205; \\
\delta_F &= 0,01\%; \\
F_{89} &= \sin(b) - a \times d + c \\
a_{89} &= 6,413; \\
b_{89} &= 5,92; \\
c_{89} &= 8,807; \\
d_{89} &= 8,547; \\
\delta_F &= 0,06\%; \\
F_{90} &= c^a + d^3 + b \\
a_{90} &= 5,683; \\
b_{90} &= 8,756; \\
c_{90} &= 7,668; \\
d_{90} &= 8,184; \\
\delta_F &= 0,06\%; \\
F_{91} &= \frac{\log_a(b)}{c^b + a} \\
a_{91} &= 8,140; \\
b_{91} &= 8,755; \\
c_{91} &= 5,445; \\
d_{91} &= 6,650; \\
\delta_F &= 0,08\%; \\
F_{92} &= b \times \sin(c) + d - a \\
a_{92} &= 7,633; \\
b_{92} &= 6,636; \\
c_{92} &= 8,906; \\
d_{92} &= 6,620; \\
\delta_F &= 0,02\%; \\
F_{93} &= \frac{c^b}{2^a - d} \\
a_{93} &= 7,199; \\
b_{93} &= 7,465; \\
c_{93} &= 7,78; \\
d_{93} &= 5,848; \\
\delta_F &= 0,09\%;
\end{aligned}$$

$$F_{94} = \cos(c) - b + d \times \cos(a)$$

$$a_{94} = 7,306;$$

$$b_{94} = 8,473;$$

$$c_{94} = 7,336;$$

$$d_{94} = 5,188;$$

$$\delta_F = 0,01\%;$$

$$F_{95} = \frac{b+c}{6^d+a}$$

$$a_{95} = 7,760;$$

$$b_{95} = 8,646;$$

$$c_{95} = 5,526;$$

$$d_{95} = 7,649;$$

$$\delta_F = 0,08\%;$$

$$F_{96} = 4^d + c \times b + a$$

$$a_{96} = 6,924;$$

$$b_{96} = 5,802;$$

$$c_{96} = 8,580;$$

$$d_{96} = 5,708;$$

$$\delta_F = 0,02\%;$$

$$F_{97} = \cos(c) - d \times \sin(a) + b$$

$$a_{97} = 6,908;$$

$$b_{97} = 5,739;$$

$$c_{97} = 6,872;$$

$$d_{97} = 6,772;$$

$$\delta_F = 0,04\%;$$

$$F_{98} = c \times \cos(d) \times a \times \sin(b)$$

$$a_{98} = 5,585;$$

$$b_{98} = 6,653;$$

$$c_{98} = 8,388;$$

$$d_{98} = 7,866;$$

$$\delta_F = 0,03\%;$$

$$F_{99} = \sin(a) + c - b \times \cos(d)$$

$$a_{99} = 6,86;$$

$$b_{99} = 6,763;$$

$$c_{99} = 5,667;$$

$$d_{99} = 7,213;$$

$$\delta_F = 0,07\%;$$

$$F_{100} = c^3 + b \times d^a$$

$$a_{100} = 5,985;$$

$$b_{100} = 7,608;$$

$$c_{100} = 5,401;$$

$$d_{100} = 5,347;$$

$$\delta_F = 0,05\%;$$

$$F_{101} = \frac{\log_a(b)}{d^r + c}$$

$$a_{101} = 5,779;$$

$$b_{101} = 8,751;$$

$$c_{101} = 5,498;$$

$$d_{101} = 7,306;$$

$$\delta_F = 0,03\%;$$

7 Задание VII

VII. Найти аналитический вид функции по её значениям, представленным в таблице. Для определения значений параметров использовать следующие методы: метод выбранных точек, метод средних и метод наименьших квадратов.

x	F_1	F_2	F_3	F_4	F_5
1,200	1,042	0,650	0,958	0,126	7,107
1,300	1,091	0,620	1,021	0,126	7,392
1,500	1,196	0,568	1,158	0,126	7,929
1,700	1,312	0,524	1,313	0,126	8,430
1,900	1,438	0,486	1,490	0,126	8,902
2,200	1,651	0,439	1,799	0,126	9,565
2,500	1,895	0,400	2,174	0,125	10,184
2,800	2,175	0,367	2,626	0,125	10,765
3,100	2,497	0,340	3,172	0,125	11,316
3,500	3,002	0,309	4,082	0,125	12,009
3,900	3,608	0,283	5,251	0,125	12,663
4,300	4,337	0,261	6,756	0,125	13,284

x	F_6	F_7	F_8	F_9	F_{10}
1,200	157,248	420,183	4,223	0,156	1660,021
1,300	199,927	429,363	4,155	0,159	1722,454
1,500	307,125	446,277	4,024	0,165	1834,073
1,700	447,083	461,616	3,902	0,170	1931,700
1,900	624,169	475,689	3,786	0,175	2018,456
2,200	968,968	494,896	3,626	0,181	2132,807
2,500	1421,875	512,276	3,478	0,187	2232,517
2,800	1997,632	528,193	3,342	0,191	2320,913
3,100	2710,981	542,910	3,216	0,196	2400,304
3,500	3901,625	560,994	3,063	0,201	2494,965
3,900	5398,029	577,627	2,923	0,205	2579,372
4,300	7235,137	593,057	2,796	0,209	2655,530

x	F_{11}	F_{12}	F_{13}	F_{14}	F_{15}
1,200	8,524	1,339	0,984	25,381	18,510
1,300	8,588	1,245	0,977	24,938	21,020
1,500	8,716	1,093	0,962	24,096	26,638
1,700	8,846	0,974	0,947	23,310	33,056
1,900	8,978	0,878	0,933	22,573	40,275
2,200	9,179	0,765	0,912	21,552	52,602
2,500	9,385	0,678	0,893	20,619	66,730
2,800	9,596	0,609	0,874	19,763	82,658
3,100	9,811	0,552	0,856	18,975	100,385
3,500	10,106	0,491	0,833	18,018	126,822
3,900	10,410	0,443	0,812	17,153	156,459
4,300	10,722	0,403	0,791	16,367	189,296

x	F_{16}	F_{17}	F_{18}	F_{19}	F_{20}
1,200	75,288	162,686	11,768	1168,209	820,403
1,300	75,414	179,796	12,424	1183,417	888,473
1,500	75,641	219,603	13,597	1210,606	1024,630
1,700	75,840	268,223	14,624	1234,387	1160,809
1,900	76,018	327,609	15,536	1255,520	1297,011
2,200	76,252	442,226	16,738	1283,375	1501,355
2,500	76,457	596,942	17,786	1307,663	1705,750
2,800	76,639	805,788	18,716	1329,196	1910,195
3,100	76,803	1087,700	19,550	1348,534	2114,691
3,500	76,999	1622,657	20,545	1371,593	2387,430
3,900	77,174	2420,720	21,433	1392,153	2660,259
4,300	77,333	3611,290	22,233	1410,705	2933,177

x	F_{21}	F_{22}	F_{23}	F_{24}	F_{25}
1,200	1013,706	13,652	4,394	0,698	874,866
1,300	1097,828	13,900	4,715	0,706	881,473
1,500	1266,102	14,410	5,287	0,721	893,410
1,700	1434,416	14,938	5,788	0,733	903,984
1,900	1602,769	15,485	6,233	0,744	913,485
2,200	1855,372	16,345	6,819	0,759	926,160
2,500	2108,062	17,251	7,330	0,772	937,357
2,800	2360,842	18,209	7,784	0,783	947,395
3,100	2613,709	19,219	8,191	0,793	956,503
3,500	2951,003	20,654	8,676	0,806	967,477
3,900	3288,453	22,196	9,109	0,816	977,369
4,300	3626,060	23,853	9,500	0,826	986,381

x	F_{26}	F_{27}	F_{28}	F_{29}	F_{30}
1,200	23,127	709,144	0,944	23,525	7,807
1,300	24,649	768,169	1,016	25,355	7,851
1,500	27,698	886,225	1,157	29,070	7,940
1,700	30,754	1004,289	1,297	32,859	8,029
1,900	33,818	1122,361	1,435	36,721	8,120
2,200	38,426	1299,484	1,639	42,653	8,257
2,500	43,050	1476,625	1,842	48,750	8,397
2,800	47,690	1653,784	2,042	55,013	8,539
3,100	52,346	1830,961	2,240	61,441	8,684
3,500	58,578	2067,225	2,501	70,270	8,881
3,900	64,838	2303,521	2,760	79,393	9,082
4,300	71,127	2539,849	3,017	88,811	9,288

x	F_{31}	F_{32}	F_{33}	F_{34}	F_{35}
1,200	0,362	0,100	391,016	1,631	292,576
1,300	0,412	0,107	458,534	1,517	316,676
1,500	0,534	0,120	609,770	1,332	364,900
1,700	0,693	0,134	782,606	1,186	413,156
1,900	0,899	0,147	977,042	1,070	461,444
2,200	1,327	0,165	1309,196	0,932	533,936
2,500	1,960	0,184	1689,950	0,826	606,500
2,800	2,895	0,202	2119,304	0,741	679,136
3,100	4,276	0,220	2597,258	0,672	751,844
3,500	7,192	0,243	3310,130	0,598	848,900
3,900	12,097	0,266	4109,402	0,539	946,084
4,300	20,348	0,289	4995,074	0,490	1043,396

x	F_{36}	F_{37}	F_{38}	F_{39}	F_{40}
1,200	0,912	2,632	157,174	1,849	1,441
1,300	0,915	2,532	171,289	1,829	1,588
1,500	0,921	2,353	203,436	1,791	1,928
1,700	0,926	2,198	241,616	1,753	2,341
1,900	0,932	2,062	286,963	1,718	2,842
2,200	0,940	1,887	371,427	1,667	3,802
2,500	0,949	1,739	480,752	1,619	5,086
2,800	0,957	1,613	622,256	1,574	6,804
3,100	0,966	1,504	805,410	1,532	9,102
3,500	0,977	1,379	1136,094	1,478	13,417
3,900	0,989	1,274	1602,550	1,428	19,776
4,300	1,001	1,183	2260,523	1,382	29,151

x	F_{41}	F_{42}	F_{43}	F_{44}	F_{45}
1,200	4,950	57,416	2775,425	81,439	7,258
1,300	5,010	58,161	2822,650	85,445	7,670
1,500	5,115	59,491	2907,080	93,106	8,466
1,700	5,208	60,655	2980,926	100,367	9,230
1,900	5,290	61,690	3046,549	107,294	9,966
2,200	5,399	63,053	3133,045	117,159	11,027
2,500	5,493	64,242	3208,467	126,499	12,044
2,800	5,577	65,296	3275,331	135,400	13,023
3,100	5,653	66,243	3335,383	143,926	13,971
3,500	5,742	67,371	3406,985	154,797	15,191
3,900	5,823	68,378	3470,831	165,182	16,369
4,300	5,895	69,286	3528,438	175,147	17,509

x	F_{46}	F_{47}	F_{48}	F_{49}	F_{50}
1,200	0,484	2,809	398,006	6,782	0,225
1,300	0,615	2,618	431,007	7,436	0,221
1,500	0,945	2,304	497,009	8,898	0,214
1,700	1,376	2,058	563,012	10,568	0,208
1,900	1,921	1,859	629,014	12,447	0,202
2,200	2,981	1,623	728,019	15,654	0,194
2,500	4,375	1,441	827,025	19,330	0,186
2,800	6,147	1,295	926,031	23,474	0,179
3,100	8,341	1,176	1025,038	28,085	0,172
3,500	12,005	1,048	1157,049	34,962	0,164
3,900	16,609	0,945	1289,061	42,671	0,157
4,300	22,262	0,861	1421,074	51,212	0,150

x	F_{51}	F_{52}	F_{53}	F_{54}	F_{55}
1,200	9,143	0,756	0,884	0,127	0,776
1,300	9,190	0,803	0,893	0,128	0,720
1,500	9,284	0,887	0,910	0,131	0,630
1,700	9,379	0,961	0,927	0,133	0,559
1,900	9,475	1,027	0,944	0,135	0,503
2,200	9,621	1,113	0,971	0,138	0,437
2,500	9,769	1,189	0,999	0,140	0,386
2,800	9,920	1,256	1,028	0,143	0,346
3,100	10,073	1,316	1,057	0,145	0,314
3,500	10,281	1,387	1,098	0,147	0,279
3,900	10,493	1,451	1,140	0,149	0,251
4,300	10,709	1,509	1,184	0,151	0,228

x	F_{56}	F_{57}	F_{58}	F_{59}	F_{60}
1,200	17,549	10,276	5,869	2,597	0,990
1,300	17,685	11,816	5,583	2,445	0,993
1,500	17,959	15,250	5,089	2,188	0,998
1,700	18,238	19,156	4,675	1,980	1,003
1,900	18,521	23,534	4,323	1,808	1,009
2,200	18,954	30,986	3,885	1,600	1,017
2,500	19,396	39,500	3,527	1,435	1,024
2,800	19,850	49,076	3,230	1,300	1,032
3,100	20,314	59,714	2,979	1,189	1,041
3,500	20,949	75,550	2,699	1,067	1,051
3,900	21,604	93,274	2,467	0,968	1,062
4,300	22,280	112,886	2,272	0,886	1,074

x	F_{61}	F_{62}	F_{63}	F_{64}	F_{65}
1,200	0,309	66,637	792,905	4,817	0,800
1,300	0,314	66,690	798,637	4,764	0,742
1,500	0,321	66,797	808,989	4,662	0,649
1,700	0,328	66,904	818,154	4,564	0,576
1,900	0,335	67,011	826,385	4,470	0,518
2,200	0,343	67,172	837,361	4,337	0,450
2,500	0,351	67,333	847,050	4,211	0,398
2,800	0,357	67,495	855,734	4,092	0,357
3,100	0,364	67,657	863,609	3,979	0,323
3,500	0,371	67,874	873,093	3,839	0,287
3,900	0,378	68,092	881,638	3,708	0,258
4,300	0,384	68,310	889,420	3,586	0,235

x	F_{66}	F_{67}	F_{68}	F_{69}	F_{70}
1,200	9,032	809,968	878,792	0,219	177,232
1,300	9,407	836,382	951,930	0,222	207,268
1,500	10,175	883,605	1098,237	0,227	274,540
1,700	10,967	924,909	1244,590	0,231	351,412
1,900	11,783	961,613	1390,986	0,234	437,884
2,200	13,052	1009,992	1610,662	0,239	585,592
2,500	14,375	1052,177	1830,438	0,243	754,900
2,800	15,752	1089,576	2050,312	0,247	945,808
3,100	17,183	1123,164	2270,285	0,251	1158,316
3,500	19,175	1163,213	2563,738	0,255	1475,260
3,900	21,263	1198,924	2857,365	0,258	1830,604
4,300	23,447	1231,144	3151,169	0,261	2224,348

x	F_{71}	F_{72}	F_{73}	F_{74}	F_{75}
1,200	474,094	0,847	10,101	272,250	727,577
1,300	513,284	0,833	9,756	300,882	736,361
1,500	591,710	0,806	9,132	367,499	754,247
1,700	670,196	0,781	8,584	448,864	772,568
1,900	748,744	0,758	8,097	548,243	791,334
2,200	866,678	0,725	7,463	740,051	820,341
2,500	984,750	0,694	6,920	998,965	850,411
2,800	1102,958	0,667	6,452	1348,461	881,584
3,100	1221,304	0,641	6,042	1820,232	913,899
3,500	1379,310	0,610	5,571	2715,467	958,836
3,900	1537,560	0,581	5,168	4051,001	1005,982
4,300	1696,052	0,556	4,819	6043,383	1055,447

x	F_{76}	F_{77}	F_{78}	F_{79}	F_{80}
1,200	1,462	0,777	1,091	1041,084	0,152
1,300	1,525	0,781	1,154	1115,273	0,152
1,500	1,638	0,787	1,275	1261,329	0,152
1,700	1,737	0,793	1,392	1404,676	0,151
1,900	1,825	0,800	1,505	1545,675	0,151
2,200	1,940	0,810	1,667	1753,370	0,151
2,500	2,041	0,820	1,823	1957,124	0,150
2,800	2,131	0,830	1,974	2157,476	0,150
3,100	2,211	0,840	2,119	2354,838	0,150
3,500	2,307	0,854	2,307	2613,897	0,149
3,900	2,393	0,868	2,489	2868,835	0,149
4,300	2,470	0,883	2,665	3120,131	0,148

x	F_{81}	F_{82}	F_{83}	F_{84}	F_{85}
1,200	57,320	2,822	0,768	1,084	4,155
1,300	65,580	2,773	0,770	1,213	4,212
1,500	83,900	2,681	0,773	1,482	4,313
1,700	104,620	2,595	0,776	1,766	4,402
1,900	127,740	2,514	0,779	2,063	4,481
2,200	166,920	2,402	0,784	2,533	4,585
2,500	211,500	2,299	0,788	3,030	4,676
2,800	261,480	2,205	0,793	3,551	4,757
3,100	316,860	2,118	0,798	4,094	4,829
3,500	399,100	2,012	0,804	4,853	4,915
3,900	490,940	1,916	0,811	5,646	4,992
4,300	592,380	1,829	0,817	6,473	5,061

x	F_{86}	F_{87}	F_{88}	F_{89}	F_{90}
1,200	0,178	0,655	2,732	0,247	11,014
1,300	0,184	0,657	2,805	0,247	12,223
1,500	0,195	0,661	2,957	0,246	14,928
1,700	0,205	0,665	3,116	0,246	18,017
1,900	0,213	0,668	3,282	0,245	21,489
2,200	0,224	0,672	3,545	0,245	27,419
2,500	0,234	0,676	3,825	0,244	34,213
2,800	0,243	0,679	4,121	0,243	41,870
3,100	0,250	0,682	4,434	0,242	50,392
3,500	0,260	0,686	4,877	0,242	63,098
3,900	0,268	0,689	5,349	0,241	77,340
4,300	0,275	0,692	5,851	0,240	93,118

x	F_{91}	F_{92}	F_{93}	F_{94}	F_{95}
1,200	0,219	18,640	25,488	5,663	53,410
1,300	0,249	21,020	26,171	5,394	53,888
1,500	0,323	26,200	27,436	4,926	54,855
1,700	0,419	31,940	28,593	4,533	55,841
1,900	0,544	38,240	29,662	4,198	56,843
2,200	0,803	48,740	31,132	3,779	58,382
2,500	1,186	60,500	32,474	3,436	59,961
2,800	1,752	73,520	33,711	3,151	61,584
3,100	2,588	87,800	34,863	2,909	63,250
3,500	4,353	108,800	36,287	2,639	65,543
3,900	7,322	132,040	37,606	2,414	67,918
4,300	12,316	157,520	38,838	2,225	70,379

x	F_{96}	F_{97}	F_{98}	F_{99}	F_{100}
1,200	0,932	3,728	1983,256	4,961	7,292
1,300	0,866	3,963	2023,277	4,988	7,571
1,500	0,758	4,437	2094,827	5,037	8,131
1,700	0,674	4,916	2157,409	5,080	8,694
1,900	0,607	5,400	2213,022	5,119	9,260
2,200	0,528	6,135	2286,323	5,170	10,114
2,500	0,468	6,881	2350,240	5,215	10,975
2,800	0,419	7,638	2406,905	5,255	11,842
3,100	0,380	8,406	2457,796	5,292	12,716
3,500	0,338	9,447	2518,476	5,336	13,891
3,900	0,304	10,508	2572,583	5,375	15,078
4,300	0,277	11,588	2621,402	5,411	16,276

8 Задание VIII

VIII. Вычислить значения функции $y = F(x)$ в двух заданных точках с использованием прямой и обратной интерполяционных формул Ньютона.

x	2,00	2,01	2,02	2,03	2,04
$F_1(x)$	-2,940024	-2,954797	-2,969718	-2,984785	-3,000000

$$F_1(2,0326) = ?$$

$$F_1(2,0063) = ?$$

x	2,05	2,06	2,07	2,08	2,09
$F_2(x)$	-5,901004	-5,925406	-5,950040	-5,974904	-6,000000

$$F_2(2,0746) = ?$$

$$F_2(2,0712) = ?$$

x	2,10	2,11	2,12	2,13	2,14
$F_3(x)$	-2,964227	-2,972954	-2,981825	-2,990840	-3,000000

$$F_3(2,1144) = ?$$

$$F_3(2,1389) = ?$$

x	2,15	2,16	2,17	2,18	2,19
$F_4(x)$	-4,948719	-4,961252	-4,973977	-4,986893	-5,000000

$$F_4(2,1845) = ?$$

$$F_4(2,1819) = ?$$

x	2,20	2,21	2,22	2,23	2,24
$F_5(x)$	8,649160	8,735635	8,822930	8,911049	9,000000

$$F_5(2,2024) = ?$$

$$F_5(2,2159) = ?$$

x	2,25	2,26	2,27	2,28	2,29
$F_6(x)$	7,656917	7,741498	7,826869	7,913034	8,000000

$$F_6(2,2615) = ?$$

$$F_6(2,2760) = ?$$

x	2,30	2,31	2,32	2,33	2,34
$F_7(x)$	8,630475	8,721700	8,813693	8,906458	9,000000

$$F_7(2,3239) = ?$$

$$F_7(2,3216) = ?$$

x	2,35	2,36	2,37	2,38	2,39
$F_8(x)$	1,911459	1,933320	1,955364	1,977590	2,000000

$$F_8(2,3865) = ?$$

$$F_8(2,3822) = ?$$

x	2,40	2,41	2,42	2,43	2,44
$F_9(x)$	8,554084	8,663992	8,774943	8,886943	9,000000

$$F_9(2,4366) = ?$$

$$F_9(2,4125) = ?$$

x	2,45	2,46	2,47	2,48	2,49
$F_{10}(x)$	1,888071	1,915664	1,943515	1,971627	2,000000

$$F_{10}(2,4626) = ?$$

$$F_{10}(2,4674) = ?$$

x	2,50	2,51	2,52	2,53	2,54
$F_{11}(x)$	4,751900	4,813151	4,874915	4,937197	5,000000

$$F_{11}(2,5029) = ?$$

$$F_{11}(2,5140) = ?$$

x	2,55	2,56	2,57	2,58	2,59
$F_{12}(x)$	4,728030	4,795181	4,862891	4,931163	5,000000

$$F_{12}(2,5831) = ?$$

$$F_{12}(2,5659) = ?$$

x	2,60	2,61	2,62	2,63	2,64
$F_{13}(x)$	-5,686999	-5,763916	-5,841716	-5,920408	-6,000000

$$F_{13}(2,6387) = ?$$

$$F_{13}(2,6255) = ?$$

x	2,65	2,66	2,67	2,68	2,69
$F_{14}(x)$	-3,798128	-3,847747	-3,897929	-3,948679	-4,000000

$$F_{14}(2,6542) = ?$$

$$F_{14}(2,6559) = ?$$

x	2,70	2,71	2,72	2,73	2,74
$F_{15}(x)$	-7,591181	-7,691661	-7,793285	-7,896061	-8,000000

$$F_{15}(2,7124) = ?$$

$$F_{15}(2,7180) = ?$$

x	2,75	2,76	2,77	2,78	2,79
$F_{16}(x)$	-7,603214	-7,700762	-7,799402	-7,899146	-8,000000

$$F_{16}(2,7788) = ?$$

$$F_{16}(2,7675) = ?$$

x	2,80	2,81	2,82	2,83	2,84
$F_{17}(x)$	-6,670166	-6,751329	-6,833352	-6,916240	-7,000000

$$F_{17}(2,8337) = ?$$

$$F_{17}(2,8255) = ?$$

x	2,85	2,86	2,87	2,88	2,89
$F_{18}(x)$	-1,907988	-1,930634	-1,953517	-1,976639	-2,000000

$$F_{18}(2,8715) = ?$$

$$F_{18}(2,8874) = ?$$

x	2,90	2,91	2,92	2,93	2,94
$F_{19}(x)$	-1,907122	-1,929982	-1,953080	-1,976419	-2,000000

$$F_{19}(2,9312) = ?$$

$$F_{19}(2,9339) = ?$$

x	2,95	2,96	2,97	2,98	2,99
$F_{20}(x)$	-3,818318	-3,863045	-3,908232	-3,953882	-4,000000

$$F_{20}(2,9767) = ?$$

$$F_{20}(2,9627) = ?$$

x	3,00	3,01	3,02	3,03	3,04
$F_{21}(x)$	-2,836983	-2,877059	-2,917585	-2,958564	-3,000000

$$F_{21}(3,0332) = ?$$

$$F_{21}(3,0234) = ?$$

x	3,05	3,06	3,07	3,08	3,09
$F_{22}(x)$	-3,790030	-3,841662	-3,893865	-3,946643	-4,000000

$$F_{22}(3,0648) = ?$$

$$F_{22}(3,0640) = ?$$

x	3,10	3,11	3,12	3,13	3,14
$F_{23}(x)$	-6,627058	-6,718766	-6,811486	-6,905229	-7,000000

$$F_{23}(3,1142) = ?$$

$$F_{23}(3,1043) = ?$$

x	3,15	3,16	3,17	3,18	3,19
$F_{24}(x)$	-6,638749	-6,727604	-6,817426	-6,908222	-7,000000

$$F_{24}(3,1631) = ?$$

$$F_{24}(3,1679) = ?$$

x	3,20	3,21	3,22	3,23	3,24
$F_{25}(x)$	-3,808324	-3,855516	-3,903190	-3,951350	-4,000000

$$F_{25}(3,2218) = ?$$

$$F_{25}(3,2090) = ?$$

x	3,25	3,26	3,27	3,28	3,29
$F_{26}(x)$	-8,579181	-8,682810	-8,787485	-8,893212	-9,000000

$$F_{26}(3,2832) = ?$$

$$F_{26}(3,2874) = ?$$

x	3,30	3,31	3,32	3,33	3,34
$F_{27}(x)$	-7,622075	-7,715145	-7,809151	-7,904101	-8,000000

$$F_{27}(3,3222) = ?$$

$$F_{27}(3,3044) = ?$$

x	3,35	3,36	3,37	3,38	3,39
$F_{28}(x)$	-7,630709	-7,721672	-7,813537	-7,906311	-8,000000

$$F_{28}(3,3869) = ?$$

$$F_{28}(3,3888) = ?$$

x	3,40	3,41	3,42	3,43	3,44
$F_{29}(x)$	2,833930	2,874707	2,915975	2,957738	3,000000

$$F_{29}(3,4361) = ?$$

$$F_{29}(3,4351) = ?$$

x	3,45	3,46	3,47	3,48	3,49
$F_{30}(x)$	6,615842	6,710191	6,805660	6,902260	7,000000

$$F_{30}(3,4648) = ?$$

$$F_{30}(3,4649) = ?$$

x	3,50	3,51	3,52	3,53	3,54
$F_{31}(x)$	7,567772	7,673954	7,781379	7,890057	8,000000

$$F_{31}(3,5257) = ?$$

$$F_{31}(3,5261) = ?$$

x	3,55	3,56	3,57	3,58	3,59
$F_{32}(x)$	1,892896	1,919213	1,945835	1,972763	2,000000

$$F_{32}(3,5539) = ?$$

$$F_{32}(3,5745) = ?$$

x	3,60	3,61	3,62	3,63	3,64
$F_{33}(x)$	3,785519	3,838225	3,891537	3,945461	4,000000

$$F_{33}(3,6313) = ?$$

$$F_{33}(3,6112) = ?$$

x	3,65	3,66	3,67	3,68	3,69
$F_{34}(x)$	4,734449	4,799720	4,865731	4,932489	5,000000

$$F_{34}(3,6882) = ?$$

$$F_{34}(3,6760) = ?$$

x	3,70	3,71	3,72	3,73	3,74
$F_{35}(x)$	4,738469	4,802767	4,867784	4,933526	5,000000

$$F_{35}(3,7069) = ?$$

$$F_{35}(3,7070) = ?$$

x	3,75	3,76	3,77	3,78	3,79
$F_{36}(x)$	6,637352	6,726528	6,816689	6,907844	7,000000

$$F_{36}(3,7543) = ?$$

$$F_{36}(3,7532) = ?$$

x	3,80	3,81	3,82	3,83	3,84
$F_{37}(x)$	2,851780	2,888248	2,925105	2,962355	3,000000

$$F_{37}(3,8263) = ?$$

$$F_{37}(3,8322) = ?$$

x	3,85	3,86	3,87	3,88	3,89
$F_{38}(x)$	3,804084	3,852296	3,901017	3,950250	4,000000

$$F_{38}(3,8572) = ?$$

$$F_{38}(3,8872) = ?$$

x	3,90	3,91	3,92	3,93	3,94
$F_{39}(x)$	1,903301	1,927102	1,951151	1,975449	2,000000

$$F_{39}(3,9134) = ?$$

$$F_{39}(3,9378) = ?$$

x	3,95	3,96	3,97	3,98	3,99
$F_{40}(x)$	6,664502	6,747094	6,830537	6,914836	7,000000

$$F_{40}(3,9766) = ?$$

$$F_{40}(3,9647) = ?$$

x	4,00	4,01	4,02	4,03	4,04
$F_{41}(x)$	6,664957	6,747445	6,830777	6,914960	7,000000

$$F_{41}(4,0072) = ?$$

$$F_{41}(4,0336) = ?$$

x	4,05	4,06	4,07	4,08	4,09
$F_{42}(x)$	2,857715	2,892752	2,928143	2,963892	3,000000

$$F_{42}(4,0857) = ?$$

$$F_{42}(4,0719) = ?$$

x	4,10	4,11	4,12	4,13	4,14
$F_{43}(x)$	1,906336	1,929404	1,952703	1,976235	2,000000

$$F_{43}(4,1022) = ?$$

$$F_{43}(4,1114) = ?$$

x	4,15	4,16	4,17	4,18	4,19
$F_{44}(x)$	7,628738	7,720191	7,812548	7,905816	8,000000

$$F_{44}(4,1883) = ?$$

$$F_{44}(4,1616) = ?$$

x	4,20	4,21	4,22	4,23	4,24
$F_{45}(x)$	4,753060	4,813838	4,875250	4,937303	5,000000

$$F_{45}(4,2383) = ?$$

$$F_{45}(4,2387) = ?$$

x	4,25	4,26	4,27	4,28	4,29
$F_{46}(x)$	1,902203	1,926278	1,950601	1,975174	2,000000

$$F_{46}(4,2767) = ?$$

$$F_{46}(4,2542) = ?$$

x	4,30	4,31	4,32	4,33	4,34
$F_{47}(x)$	7,614234	7,709217	7,805167	7,902092	8,000000

$$F_{47}(4,3178) = ?$$

$$F_{47}(4,3274) = ?$$

x	4,35	4,36	4,37	4,38	4,39
$F_{48}(x)$	6,665764	6,748074	6,831212	6,915185	7,000000

$$F_{48}(4,3561) = ?$$

$$F_{48}(4,3771) = ?$$

x	4,40	4,41	4,42	4,43	4,44
$F_{49}(x)$	7,618475	7,712440	7,807344	7,903195	8,000000

$$F_{49}(4,4356) = ?$$

$$F_{49}(4,4130) = ?$$

x	4,45	4,46	4,47	4,48	4,49
$F_{50}(x)$	8,575127	8,679786	8,785479	8,892215	9,000000

$$F_{50}(4,4856) = ?$$

$$F_{50}(4,4519) = ?$$

x	4,50	4,51	4,52	4,53	4,54
$F_{51}(x)$	3,813692	3,859594	3,905943	3,952744	4,000000

$$F_{51}(4,5263) = ?$$

$$F_{51}(4,5388) = ?$$

x	4,55	4,56	4,57	4,58	4,59
$F_{52}(x)$	7,631094	7,721998	7,813780	7,906445	8,000000

$$F_{52}(4,5736) = ?$$

$$F_{52}(4,5812) = ?$$

x	4,60	4,61	4,62	4,63	4,64
$F_{53}(x)$	6,690398	6,766723	6,843761	6,921518	7,000000

$$F_{53}(4,6240) = ?$$

$$F_{53}(4,6021) = ?$$

x	4,65	4,66	4,67	4,68	4,69
$F_{54}(x)$	7,649383	7,735831	7,823080	7,911134	8,000000

$$F_{54}(4,6731) = ?$$

$$F_{54}(4,6639) = ?$$

x	4,70	4,71	4,72	4,73	4,74
$F_{55}(x)$	6,696767	6,771544	6,847005	6,923155	7,000000

$$F_{55}(4,7038) = ?$$

$$F_{55}(4,7163) = ?$$

x	4,75	4,76	4,77	4,78	4,79
$F_{56}(x)$	1,914140	1,935316	1,956684	1,978245	2,000000

$$F_{56}(4,7590) = ?$$

$$F_{56}(4,7868) = ?$$

x	4,80	4,81	4,82	4,83	4,84
$F_{57}(x)$	6,700318	6,774237	6,848820	6,924073	7,000000

$$F_{57}(4,8046) = ?$$

$$F_{57}(4,8137) = ?$$

x	4,85	4,86	4,87	4,88	4,89
$F_{58}(x)$	8,618221	8,712402	8,807422	8,903286	9,000000

$$F_{58}(4,8765) = ?$$

$$F_{58}(4,8789) = ?$$

x	4,90	4,91	4,92	4,93	4,94
$F_{59}(x)$	1,916116	1,936812	1,957691	1,978753	2,000000

$$F_{59}(4,9234) = ?$$

$$F_{59}(4,9141) = ?$$

x	4,95	4,96	4,97	4,98	4,99
$F_{60}(x)$	5,750618	5,812156	5,874230	5,936843	6,000000

$$F_{60}(4,9658) = ?$$

$$F_{60}(4,9627) = ?$$

x	5,00	5,01	5,02	5,03	5,04
$F_{61}(x)$	1,911770	1,933533	1,955492	1,977647	2,000000

$$F_{61}(5,0129) = ?$$

$$F_{61}(5,0051) = ?$$

x	5,05	5,06	5,07	5,08	5,09
$F_{62}(x)$	4,781905	4,835711	4,889993	4,944755	5,000000

$$F_{62}(5,0735) = ?$$

$$F_{62}(5,0645) = ?$$

x	5,10	5,11	5,12	5,13	5,14
$F_{63}(x)$	2,870724	2,902622	2,934800	2,967258	3,000000

$$F_{63}(5,1020) = ?$$

$$F_{63}(5,1130) = ?$$

x	5,15	5,16	5,17	5,18	5,19
$F_{64}(x)$	8,616425	8,711084	8,806563	8,902866	9,000000

$$F_{64}(5,1886) = ?$$

$$F_{64}(5,1865) = ?$$

x	5,20	5,21	5,22	5,23	5,24
$F_{65}(x)$	6,704097	6,777129	6,850788	6,925077	7,000000

$$F_{65}(5,2131) = ?$$

$$F_{65}(5,2141) = ?$$

x	5,25	5,26	5,27	5,28	5,29
$F_{66}(x)$	4,790928	4,842537	4,894583	4,947070	5,000000

$$F_{66}(5,2614) = ?$$

$$F_{66}(5,2777) = ?$$

x	5,30	5,31	5,32	5,33	5,34
$F_{67}(x)$	1,917333	1,937742	1,958322	1,979074	2,000000

$$F_{67}(5,3272) = ?$$

$$F_{67}(5,3261) = ?$$

x	5,35	5,36	5,37	5,38	5,39
$F_{68}(x)$	6,713722	6,784408	6,855681	6,927543	7,000000

$$F_{68}(5,3526) = ?$$

$$F_{68}(5,3742) = ?$$

x	5,40	5,41	5,42	5,43	5,44
$F_{69}(x)$	2,879923	2,909578	2,939475	2,969615	3,000000

$$F_{69}(5,4310) = ?$$

$$F_{69}(5,4131) = ?$$

x	5,45	5,46	5,47	5,48	5,49
$F_{70}(x)$	1,920754	1,940328	1,960059	1,979950	2,000000

$$F_{70}(5,4557) = ?$$

$$F_{70}(5,4664) = ?$$

x	5,50	5,51	5,52	5,53	5,54
$F_{71}(x)$	2,882393	2,911445	2,940730	2,970247	3,000000

$$F_{71}(5,5285) = ?$$

$$F_{71}(5,5286) = ?$$

x	5,55	5,56	5,57	5,58	5,59
$F_{72}(x)$	1,922367	1,941547	1,960878	1,980362	2,000000

$$F_{72}(5,5563) = ?$$

$$F_{72}(5,5665) = ?$$

x	5,60	5,61	5,62	5,63	5,64
$F_{73}(x)$	8,653339	8,738994	8,825319	8,912320	9,000000

$$F_{73}(5,6286) = ?$$

$$F_{73}(5,6266) = ?$$

x	5,65	5,66	5,67	5,68	5,69
$F_{74}(x)$	4,809282	4,856411	4,903905	4,951768	5,000000

$$F_{74}(5,6543) = ?$$

$$F_{74}(5,6627) = ?$$

x	5,70	5,71	5,72	5,73	5,74
$F_{75}(x)$	3,848980	3,886303	3,923913	3,961812	4,000000

$$F_{75}(5,7257) = ?$$

$$F_{75}(5,7174) = ?$$

x	5,75	5,76	5,77	5,78	5,79
$F_{76}(x)$	2,887813	2,915542	2,943482	2,971634	3,000000

$$F_{76}(5,7787) = ?$$

$$F_{76}(5,7515) = ?$$

x	5,80	5,81	5,82	5,83	5,84
$F_{77}(x)$	4,808578	4,855882	4,903553	4,951591	5,000000

$$F_{77}(5,8167) = ?$$

$$F_{77}(5,8387) = ?$$

x	5,85	5,86	5,87	5,88	5,89
$F_{78}(x)$	2,886284	2,914388	2,942709	2,971245	3,000000

$$F_{78}(5,8650) = ?$$

$$F_{78}(5,8776) = ?$$

x	5,90	5,91	5,92	5,93	5,94
$F_{79}(x)$	7,699892	7,774071	7,848814	7,924122	8,000000

$$F_{79}(5,9282) = ?$$

$$F_{79}(5,9317) = ?$$

x	5,95	5,96	5,97	5,98	5,99
$F_{80}(x)$	7,702794	7,776265	7,850287	7,924864	8,000000

$$F_{80}(5,9838) = ?$$

$$F_{80}(5,9787) = ?$$

x	6,00	6,01	6,02	6,03	6,04
$F_{81}(x)$	6,741945	6,805743	6,870017	6,934768	7,000000

$$F_{81}(6,0272) = ?$$

$$F_{81}(6,0030) = ?$$

x	6,05	6,06	6,07	6,08	6,09
$F_{82}(x)$	2,890459	2,917543	2,944828	2,972313	3,000000

$$F_{82}(6,0766) = ?$$

$$F_{82}(6,0623) = ?$$

x	6,10	6,11	6,12	6,13	6,14
$F_{83}(x)$	3,855392	3,891151	3,927171	3,963453	4,000000

$$F_{83}(6,1381) = ?$$

$$F_{83}(6,1114) = ?$$

x	6,15	6,16	6,17	6,18	6,19
$F_{84}(x)$	5,785111	5,838254	5,891782	5,945696	6,000000

$$F_{84}(6,1812) = ?$$

$$F_{84}(6,1616) = ?$$

x	6,20	6,21	6,22	6,23	6,24
$F_{85}(x)$	4,824080	4,867592	4,911416	4,955551	5,000000

$$F_{85}(6,2019) = ?$$

$$F_{85}(6,2155) = ?$$

x	6,25	6,26	6,27	6,28	6,29
$F_{86}(x)$	8,686179	8,763808	8,841986	8,920716	9,000000

$$F_{86}(6,2571) = ?$$

$$F_{86}(6,2730) = ?$$

x	6,30	6,31	6,32	6,33	6,34
$F_{87}(x)$	1,930908	1,948001	1,965213	1,982546	2,000000

$$F_{87}(6,3081) = ?$$

$$F_{87}(6,3067) = ?$$

x	6,35	6,36	6,37	6,38	6,39
$F_{88}(x)$	7,726060	7,793836	7,862084	7,930804	8,000000

$$F_{88}(6,3720) = ?$$

$$F_{88}(6,3863) = ?$$

x	6,40	6,41	6,42	6,43	6,44
$F_{89}(x)$	8,694042	8,769746	8,845972	8,922723	9,000000

$$F_{89}(6,4033) = ?$$

$$F_{89}(6,4386) = ?$$

x	6,45	6,46	6,47	6,48	6,49
$F_{90}(x)$	7,730393	7,797109	7,864280	7,931910	8,000000

$$F_{90}(6,4515) = ?$$

$$F_{90}(6,4888) = ?$$

x	6,50	6,51	6,52	6,53	6,54
$F_{91}(x)$	4,833000	4,874329	4,915938	4,957827	5,000000

$$F_{91}(6,5118) = ?$$

$$F_{91}(6,5269) = ?$$

x	6,55	6,56	6,57	6,58	6,59
$F_{92}(x)$	7,735070	7,800640	7,866651	7,933103	8,000000

$$F_{92}(6,5839) = ?$$

$$F_{92}(6,5785) = ?$$

x	6,60	6,61	6,62	6,63	6,64
$F_{93}(x)$	4,841501	4,880743	4,920240	4,959992	5,000000

$$F_{93}(6,6056) = ?$$

$$F_{93}(6,6069) = ?$$

x	6,65	6,66	6,67	6,68	6,69
$F_{94}(x)$	1,937097	1,952672	1,968347	1,984123	2,000000

$$F_{94}(6,6534) = ?$$

$$F_{94}(6,6573) = ?$$

x	6,70	6,71	6,72	6,73	6,74
$F_{95}(x)$	3,875194	3,906099	3,937202	3,968501	4,000000

$$F_{95}(6,7123) = ?$$

$$F_{95}(6,7328) = ?$$

x	6,75	6,76	6,77	6,78	6,79
$F_{96}(x)$	4,845196	4,883532	4,922111	4,960933	5,000000

$$F_{96}(6,7888) = ?$$

$$F_{96}(6,7516) = ?$$

x	6,80	6,81	6,82	6,83	6,84
$F_{97}(x)$	3,877017	3,907476	3,938125	3,968966	4,000000

$$F_{97}(6,8210) = ?$$

$$F_{97}(6,8322) = ?$$

x	6,85	6,86	6,87	6,88	6,89
$F_{98}(x)$	3,877954	3,908182	3,938599	3,969205	4,000000

$$F_{98}(6,8641) = ?$$

$$F_{98}(6,8624) = ?$$

x	6,90	6,91	6,92	6,93	6,94
$F_{99}(x)$	8,727514	8,795009	8,862920	8,931250	9,000000

$$F_{99}(6,9027) = ?$$

$$F_{99}(6,9252) = ?$$

x	6,95	6,96	6,97	6,98	6,99
$F_{100}(x)$	5,819705	5,864367	5,909303	5,954513	6,000000

$$F_{100}(6,9668) = ?$$

$$F_{100}(6,9854) = ?$$

x	7,00	7,01	7,02	7,03	7,04
$F_{101}(x)$	1,940554	1,955281	1,970098	1,985004	2,000000

$$F_{101}(7,0056) = ?$$

$$F_{101}(7,0018) = ?$$

9 Задание IX

IX. С помощью численных методов найти производную функции из седьмой задачи в точке $x = 2,5$. Привести погрешность, сравнив результат с аналитическим.

10 Задание X

X. При помощи квадратурных формул Котеса ($k=2$, $k=3$, $k=4$) вычислить значение интеграла функции. Пусть номер варианта равен n , тогда $F(x)$ имеет следующий вид:

$F(x) = n \times \sin(0,2nx)$, а её значения округляются до пяти значащих цифр.

Параметры аргумента: $x_0 = 0,1n$, $\Delta x = 0,03$. Точек: 13. Результат сравнить с аналитическим.