Интерполирование.

Построение интерполяционного многочлена, используя формулу Лагранжа.

Пример:

Функция $y = f(x)$ определена таблицей

i	0	1	2	3
x_i	0.5	1.1	1.7	2.3
y_i	-0.778	0.2108	-0.0244	-0.1876

определить интерполяционный многочлен.

$$l_0 = \frac{(x-x_1)\cdot(x-x_2)\cdot(x-x_3)}{(x_0-x_1)\cdot(x_0-x_2)\cdot(x_0-x_3)}\cdot y_0 = \frac{(x-1.1)\cdot(x-1.7)\cdot(x-2.3)}{(0.5-1.1)\cdot(0.5-1.7)\cdot(0.5-2.3)}\cdot(-0.778) =$$

$$0.6003x^3 - 3.0616x^2 + 4.9886x - 2.5819$$

$$l_1(x) = \frac{(x-x_0)\cdot(x-x_2)\cdot(x-x_3)}{(x_1-x_0)\cdot(x_1-x_2)\cdot(x_1-x_3)}\cdot y_1 = \frac{(x-0.5)\cdot(x-1.7)\cdot(x-2.3)}{(1.1-0.5)\cdot(1.1-1.7)\cdot(1.1-2.3)}\cdot 0.2108$$

$$0.4880x^3 - 2.1958x^2 + 2.8839x - 0.9540$$

$$l_2(x) = \frac{(x-x_0)\cdot(x-x_1)\cdot(x-x_3)}{(x_2-x_0)\cdot(x_2-x_1)\cdot(x_2-x_3)}\cdot y_2 = \frac{(x-0.5)\cdot(x-1.1)\cdot(x-2.3)}{(1.7-0.5)\cdot(1.7-1.1)\cdot(1.7-2.3)}\cdot(-0.0244)$$

$$0.0565x^3 - 0.2203x^2 + 0.2389x - 0.0714$$

$$l_3(x) = \frac{(x-x_0)\cdot(x-x_1)\cdot(x-x_2)}{(x_3-x_0)\cdot(x_3-x_1)\cdot(x_3-x_2)}\cdot y_3 = \frac{(x-0.5)\cdot(x-1.1)\cdot(x-1.7)}{(2.3-0.5)\cdot(2.3-1.1)\cdot(2.3-1.7)}\cdot(-0.1876)$$

$$-0.1448x^3 + 0.4777x^2 - 0.4733x + 0.1354$$

$$L(x) = \sum_{i=0}^{3} l_i(x) = 1.0000x^3 - 5.0000x^2 + 7.6381x - 3.4719$$

Задания.

№	i	0	1	2	3
1	x_i	-2.4000	-1.7000	-1.0000	-0.5000
	y_i	7.2139	0.0453	-7.3310	-11.5870
2	x_i	-0.3000	0.6000	1.3000	1.8000
	y_i	-12.2327	-14.2776	-8.9511	-0.1808
3	x_i	-1.9000	-1.3000	-0.6000	0.1000
	y_i	4.3845	-2.0413	-9.1160	-13.7759
4	x_i	-1.3000	-0.5000	0.0000	0.7000
	y_i	-0.9091	-9.0800	-12.7880	-14.4915
5	x_i	-1.7000	-0.8000	-0.1000	0.7000
	y_i	4.4686	-5.1524	-11.4706	-14.5634
6	x_i	-1.9000	-1.4000	-0.6000	0.2000
	y_i	7.3971	2.4205	-6.1379	-12.7417
7	x_i	-1.7000	-1.2000	-0.4000	0.1000
	y_i	6.5122	1.3934	-7.0930	-11.4122
8	x_i	-0.6000	0.0000	0.8000	1.7000
	y_i	-3.9745	-9.8070	-14.3323	-11.4626
9	x_i	-2.0000	-1.3000	-0.7000	-0.1000
	y_i	10.6430	4.6305	-1.7781	-7.9772
10	x_i	-0.6000	0.1000	0.7000	1.6000
	y_i	-1.7342	-8.8626	-13.1951	-13.6472
11	x_i	-1.8000	-1.1000	-0.4000	0.3000
	y_i	10.6930	4.7113	-2.7738	-9.7043
12	x_i	-0.3000	0.6000	1.5000	2.0000
	y_i	-2.7294	-11.2640	-14.5270	-12.4520
13	x_i	-1.3000	-0.5000	0.0000	0.9000
	y_i	8.5147	0.5750	-4.8150	-12.5741
14	x_i	-2.7000	-2.0000	-1.1000	-0.6000
	y_i	11.4472	12.9340	7.6888	2.7658
15	x_i	-1.2000	-0.7000	0.1000	0.8000
	y_i	9.3859	4.8763	-3.6723	-10.3985
16	x_i	-2.8000	-2.2000	-1.5000	-1.0000
	y_i	8.6580	12.8160	11.9395	8.6170

№	i	0	1	2	3
17	x_i	-2.2000	-1.3000	-0.5000	0.4000
	y_i	12.4561	11.4432	4.9573	-4.6451
18	x_i	-2.0000	-1.5000	-0.7000	-0.1000
	y_i	12.7890	12.7297	7.8312	1.8733
19	x_i	-2.3000	-1.7000	-1.1000	-0.4000
	y_i	10.5265	13.1059	11.4870	6.0210
20	x_i	-2.9000	-2.1000	-1.5000	-0.7000
	y_i	0.4013	11.2765	13.0968	9.5396
21	x_i	-1.8000	-1.1000	-0.3000	0.6000
	y_i	12.3896	12.4446	7.0413	-2.3344
22	x_i	-0.7000	0.1000	0.6000	1.5000
	y_i	10.9759	4.1477	-1.2041	-10.1670
23	x_i	-1.3000	-0.7000	0.1000	0.7000
	y_i	13.0979	11.5757	5.2005	-1.1601
24	x_i	-0.5000	0.1000	0.9000	1.8000
	y_i	11.0260	6.2169	-2.2023	-10.8967
25	x_i	-0.1000	0.8000	1.3000	1.9000
	y_i	8.9142	0.0178	-5.3474	-10.8642
26	x_i	-1.2000	-0.7000	-0.2000	0.6000
	y_i	12.6896	12.8158	10.4340	3.2784
27	x_i	-2.8000	-2.1000	-1.6000	-1.0000
	y_i	-16.7440	1.8299	9.2596	12.9420
28	x_i	-1.5000	-0.6000	0.0000	0.6000
	y_i	9.2168	13.0256	10.4880	5.4008
29	x_i	-2.0000	-1.5000	-1.0000	-0.5000
	y_i	-0.3760	8.0197	12.2390	13.0317
30	x_i	-0.5000	0.4000	1.2000	1.9000
	y_i	13.1117	9.0766	1.3214	-6.1627
31	x_i	-0.4000	0.5000	1.2000	2.1000
	y_i	13.1127	9.1097	2.4381	-7.1146
32	x_i	-2.6000	-2.0000	-1.4000	-0.7000
	y_i	-28.9130	-8.0670	5.0110	12.1796