БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

ИНФОРМАТИКИ И РАДИОЭЛЕКТРОНИКИ

Кафедра программного обеспечения информационных технологий

Факультет КСиС

Специальность ПОИТ

Лабораторная работа № 4

по дисциплине «МОптим»

Выполнил студент: Шиш А.А.

группа 751004

Минск 2019

**Задание 1**

f (х) = х^2 - 9х + 3

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. | | | | | a | | | | | |  | | | | | |  | | | | | |
|  | | | | | т.к N - чётное | | | | | | | | | | | |  | | | | | |
|  | | | | | x2j-1=a + (b-a)/(N/2+1) \* j - ε/2 | | | | | | | | | | | | | | | | | |
|  | | | | | x2j = a + (b-a)/(N/2+1) \* j + ε/2 | | | | | | | | | | | | | | | | | |
|  | | | | | x2j-1 = 8j/9 - 0,05 | | | | | | | | | | | |  | | | | | |
|  | | | | | x2j = 8j/9 + 0,05 | | | | | | | | | | | |  | | | | | |
| Номер подсчёта | | | | | | | | | | 1 | | | | | | | 2 | | | | | 3 | | | | | 4 | | | | | | 5 | | | |
| x | | | | |  | | | | | 0,838888889 | | | | | | | 0,93888889 | | | | | 1,727777778 | | | | | 1,827777778 | | | | | | 2,616666667 | | | |
| f(x) | | | | |  | | | | | -3,84626543 | | | | | | | -4,5684877 | | | | | -9,564783951 | | | | | -10,1092284 | | | | | | -13,70305556 | | | |
| 6 | | | | | 7 | | | | | | 8 | | | | 9 | | | | | 10 | | | | | 11 | | | 12 | | | 13 | | | 14 | | |
| 2,716667 | | | | | 3,505556 | | | | | | 3,605556 | | | | 4,394444 | | | | | 4,494444 | | | | | 5,283333 | | | 5,383333 | | | 6,172222 | | | 6,272222 | | |
| -14,0697 | | | | | -16,2611 | | | | | | -16,45 | | | | -17,2389 | | | | | -17,25 | | | | | -16,6364 | | | -16,4697 | | | -14,4537 | | | -14,1092 | | |
| 15 | | | 16 | | | | | | | 17 | | | |
| 7,061111 | | | 7,161111 | | | | | | | 7,95 | | | |
| -10,6907 | | | -10,1685 | | | | | | | -5,3475 | | | |
| min | | | | -17,25 | | | | | |
|  | | | |  | | | | | |
| б | | | |  | | | | | |
| т.к N - нечётное | | | | | | | | | |
| xi = a + (b-a)/(N+1) \* i | | | | | | | | | |
| xi = 8\*i/18 = 4\*i/9 | | | | | | | | | |
| Номер подсчёта | | | | | | | | 1 | | | | | | | 2 | | | | | 3 | | | | | | 4 | | | | | | 5 | | | | |
| x | | | | |  | | | 0,444444444 | | | | | | | 0,88888889 | | | | | 1,333333333 | | | | | | 1,777777778 | | | | | | 2,222222222 | | | | |
| f(x) | | | | |  | | | -0,80246914 | | | | | | | -4,2098765 | | | | | -7,222222222 | | | | | | -9,839506173 | | | | | | -12,0617284 | | | | |
| 6 | | | 7 | | | | | 8 | | | | | 9 | | | | | 10 | | | | 11 | | | | 12 | | | | 13 | | 14 | | | |
| 2,666667 | | | 3,111111 | | | | | 3,555556 | | | | | 4 | | | | | 4,444444 | | | | 4,888889 | | | | 5,333333 | | | | 5,777778 | | 6,222222 | | | |
| -13,8889 | | | -15,321 | | | | | -16,358 | | | | | -17 | | | | | -17,2469 | | | | -17,0988 | | | | -16,5556 | | | | -15,6173 | | -14,284 | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 15 | | 16 | | 17 | 18 |
| 6,666667 | | 7,111111 | | 7,555556 | 8 |
| -12,5556 | | -10,4321 | | -7,91358 | -5 |
| min | -17,2469 | |

|  |  |  |
| --- | --- | --- |
| 2 | Метод дихотомии |  |
|  | Количество итераций = N/2 = 8 | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Номер итерации | | | x1 | | | x2 | f1 | <=, > | f2 | a | b |
|  | 0 | | - | | | - | - | - | - | 0 | 8 |
|  | 1 | | 3,95 | | | 4,05 | -16,9475 | > | -17,0475 | 3,95 | 8 |
|  | 2 | | 5,925 | | | 6,025 | -15,219375 | < | -14,924375 | 3,95 | 6,025 |
|  | 3 | | 4,9375 | | | 5,0375 | -17,05859375 | < | -16,96109375 | 3,95 | 5,0375 |
|  | 4 | | 4,44375 | | | 4,54375 | -17,24683594 | > | -17,24808594 | 4,44375 | 5,0375 |
|  | 5 | | 4,690625 | | | 4,790625 | -17,21366211 | < | -17,16553711 | 4,44375 | 4,790625 |
|  | 6 | | 4,5671875 | | | 4,6671875 | -17,24548584 | < | -17,22204834 | 4,44375 | 4,667188 |
| (b-a) / (N/2 +1) + e/2 | | |
| 0,119375 | |  |
| 0,094687 | |  |
| |  |  |  |  | | --- | --- | --- | --- | | x1j=1/2(aj-1 + bj-1) -e/2 | | |  | | x2j=1/2(aj-1 + bj-1) +e/2 | | |  | | f1, j = f(x1), j | |  |  | | f2, j = f(x2), j | |  |  | | Если f1, j <= f2, j, то a, j = a, j-1; b, j = x2, j | | | | | Если f1, j > f2, j, то a, j = x1, j; b, j = b, j-1 | | | | | min | -17,2480859 | |  |  | | |  |

|  |  |
| --- | --- |
| 3 | Метод  фибоначчи |
| |  | | --- | | x1j = aj-1+FN-j-1/FN-j+1 \* (bj-1 - aj-1) - (-1)N-j+1/FN-j+1 \* e | | x2j = aj-1+FN-j/FN-j+1 \* (bj-1 - aj-1) - (-1)N-j+1/FN-j+1 \* e | | Если f1 <= f2, то a j = a j -1, b j = x2 j; x2 j+1 = x1 j | | Если f1 > f2, то a j = x1 j, b j = b j-1; x1 j+1 = x2 j | |  |

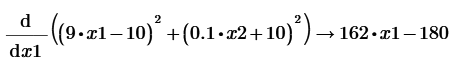
|  |  |
| --- | --- |
| e = | 0,2 |
|  | x1 | x2 | f1 | <=, > | f2 | a | b |
| 0 | - | - | - | - | - | 0 | 8 |
| 1 | 3,055604 | 4,944145272 | -15,163721 | > | -17,05273498 | 3,055604258 | 8 |
| 2 | 4,944145 | 4,944478217 | -17,052735 | < | -17,05243911 | 3,055604258 | 4,944478 |
| 3 | 3,05541 | 4,944145272 | -15,163159 | > | -17,05273498 | 3,055409836 | 4,944478 |
| 4 | 4,944145 | 4,944827586 | -17,052735 | < | -17,05212842 | 3,055409836 | 4,944828 |
| 5 | 3,054936 | 4,944145272 | -15,161789 | > | -17,05273498 | 3,054935622 | 4,944828 |
| 6 | 4,944145 | 4,945833333 | -17,052735 | < | -17,05123264 | 3,054935622 | 4,945833 |
| 7 | 3,053933 | 4,944145272 | -15,158889 | > | -17,05273498 | 3,053932584 | 4,945833 |
| 8 | 4,944145 | 4,949090909 | -17,052735 | < | -17,04831736 | 3,053932584 | 4,949091 |
| 9 | 3,052941 | 4,944145272 | -15,156021 | > | -17,05273498 | 3,052941176 | 4,949091 |
| 10 | 4,944145 | 4,961904762 | -17,052735 | < | -17,03664399 | 3,052941176 | 4,961905 |
| 11 | 3,061538 | 4,944145272 | -15,180828 | > | -17,05273498 | 3,061538462 | 4,961905 |
| 12 | 4,944145 | 5,025 | -17,052735 | < | -16,974375 | 3,061538462 | 5,025 |
| 13 | 3,16 | 4,944145272 | -15,4544 | > | -17,05273498 | 3,16 | 5,025 |
| 14 | 4,944145 | 5,4 | -17,052735 | < | -16,44 | 3,16 | 5,4 |
| 15 | 3,9 | 4,944145272 | -16,89 | > | -17,05273498 |  |  |
| |  |  | | --- | --- | | F0 | 1 | | F1 | 1 | | F2 | 2 | | F3 | 3 | | F4 | 5 | | F5 | 8 | | F6 | 13 | | F7 | 21 | | F8 | 34 | | F9 | 55 | | F10 | 89 | | F11 | 144 | | F12 | 233 | | F13 | 377 | | F14 | 610 | | F15 | 987 | | F16 | 1597 | | F17 | 2584 | | F18 | 4181 | | F19 | 6765 | |  | min | -17,0527 | |  |  |  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 4 | Метод золотого сечения | | |  |
|  | Ф1 = | 0,382 |  | Ф1+Ф2 = 1 |
|  | Ф2 = | 0,618 |  | Ф1=Ф2\*Ф2 |
|  | x1j = aj-1 + Ф1\*(bj-1 - aj-1) | | |  |
|  | x2j = aj-1 + Ф2\*(bj-1 - aj-1) | | |  |
|  | Если f1 <= f2, то a j = a j-1; b j = x2 j; x2 j+1 = x1 j | | | |
|  | Если f1 > f2, то a j = x1 j; b j = b j-1; x1 j+1 = x2 j | | | |

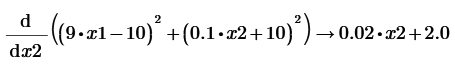
|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | x1 | x2 | f1 | <=, > | f2 | a | b |
| 0 | - | - | - | - | - | 0 | 8 |
| 1 | 3,056 | 4,944 | -15,164864 | > | -17,052864 | 3,056 | 8 |
| 2 | 4,944 | 6,111392 | -17,052864 | < | -14,65341582 | 3,056 | 6,111392 |
| 3 | 4,22316 | 4,944 | -17,173359 | < | -17,052864 | 3,056 | 4,944 |
| 4 | 3,777216 | 4,223159744 | -16,727583 | > | -17,17335947 | 3,777216 | 4,944 |
| 5 | 4,22316 | 4,498288512 | -17,173359 | > | -17,24999707 | 4,223159744 | 4,944 |
| 6 | 4,498289 | 4,668639022 | -17,249997 | < | -17,22156088 | 4,223159744 | 4,668639 |
| 7 | 4,393333 | 4,498288512 | -17,238622 | > | -17,24999707 | 4,393332828 | 4,668639 |
| 8 | 4,498289 | 4,563472056 | -17,249997 |  | -17,2459713 |  |  |

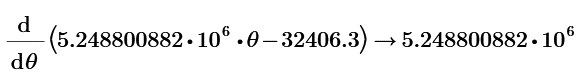
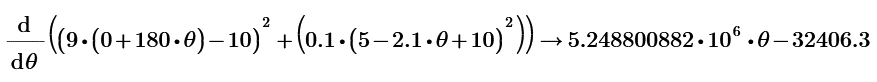
|  |  |
| --- | --- |
| min | -17,25 |

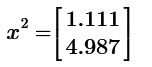
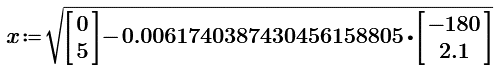
**Задание 2**







Решение задачи () -> min, >=0 и 1 = 



Применение метода Ньютона

