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CompSci 169

Homework 1

The method used for the one dimensional optimization is the golden section method. The tolerance chosen was the number 1.000000000000001e-16, which was chosen by finding the smallest number n in which the computer can recognize the inequality 1 + n > 1 as true. The stopping criteria is when the difference between x2 and x3 is less than the tolerance

The first function used was . The global minimum occurs at x = 1 with a value of 0. The starting points chosen were 2,-4,16,-32,2014. The step size chosen for bracketing the minimum was 5.

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| --- | --- | --- | --- | --- | --- |
| Starting Points | 2 | -4 | 16 | -32 | 1024 |
| Number of Function Evaluations | 79 | 77 | 80 | 78 | 86 |
| Wall-clock running time | 2.279e-4 | 1.838e-4 | 1.928e-4 | 1.877e-4 | 2.061e-4 |
| Distance between output and true minimum | 8.881e-16 | 0 | 8.881e-16 | 8.881e-16 | 0 |

|  |  |  |
| --- | --- | --- |
|  | Average | Estimated Error |
| Function Evaluations | 80 | 1.5811 |
| Running Time | 1.997e-4 | 1.435e-6 |
| Distance Between Output and True Minimum | 5.329e-16 | 1.191e-16 |

The second function used was . The global minimum occurs approximately at x = -7.5219 with a value of -1138.49. The starting points chosen were -10,-5,2,0,1,2. The step size chosen for bracketing the minimum was 2.

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| --- | --- | --- | --- | --- | --- | --- |
| Starting Points | -10 | -5 | 2 | 0 | 1 | 2 |
| Number of Function Evaluations | 74 | 76 | 73 | 74 | 73 | 73 |
| Wall-clock running time | 2.84e-4 | 2.41e-4 | 2.43e-4 | 2.32e-4 | 2.27e-4 | 2.250e-4 |
| Distance between output and true minimum | 3.137e-11 | 3.092e-11 | 3.115e-11 | 3.115e-11 | 3.092e-11 | 3.115e-11 |

|  |  |  |
| --- | --- | --- |
|  | Average | Estimated Error |
| Function Evaluations | 73.833 | 0.477 |
| Running Time | 2.42e-4 | 1.943e-10 |
| Distance Between Output and True Minimum | 3.111e-11 | 1.196e-26 |