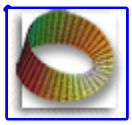


实验22　用两分法求方程的根

如下的程序是用两分法计算方程在区间[a,b]中的根：

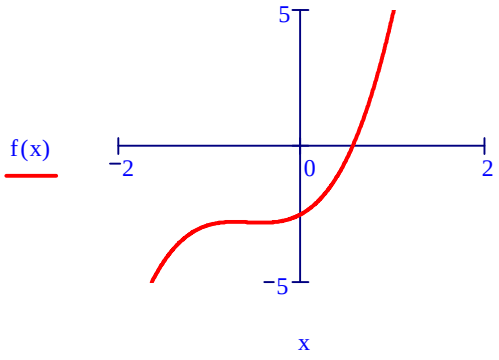
(1)

$$\text{roots}(a,b,f) := \left| \begin{array}{l} i \leftarrow 0 \\ \text{while } |b-a| \geq 10^{-3} \\ \quad \left| \begin{array}{l} c \leftarrow \dfrac{a+b}{2} \\ A_{i,0} \leftarrow a \\ A_{i,1} \leftarrow b \\ A_{i,2} \leftarrow c \\ A_{i,3} \leftarrow b-a \\ a \leftarrow c \text{ if } f(a)\cdot f(c) > 0 \\ b \leftarrow c \text{ if } f(c)\cdot f(b) > 0 \\ i \leftarrow i+1 \end{array} \right. \\ A \end{array} \right.$$

$$f(x) := 2x^3 + 3.5\cdot x^2 + 1.9\cdot x - 2.5$$

$\text{roots}(0,1,f) =$

	0	1	2	3
0	0	1	0.5	1
1	0.5	1	0.75	0.5
2	0.5	0.75	0.625	0.25
3	0.5	0.625	0.5625	0.125
4	0.5	0.5625	0.53125	0.0625
5	0.53125	0.5625	0.546875	0.03125
6	0.546875	0.5625	0.5546875	0.015625
7	0.5546875	0.5625	0.5585938	0.0078125
8	0.5546875	0.5585938	0.5566406	0.0039063
9	0.5566406	0.5585938	0.5576172	0.0019531

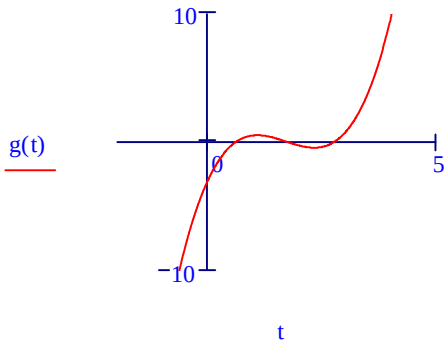


$x := 0.8$

$\text{root}(f(x),x) = 0.558333085242691$

$f(0.558333085242691) = 1.314\times 10^{-5}$

$g(t) := t^3 - 5.1 \cdot t^2 + 7.5 \cdot t - 2.9$



$roots(0, 1, g) =$

	0	1	2	3
0	0	1	0.5	1
1	0.5	1	0.75	0.5
2	0.5	0.75	0.625	0.25
3	0.5	0.625	0.563	0.125
4	0.563	0.625	0.594	0.063
5	0.594	0.625	0.609	0.031
6	0.594	0.609	0.602	0.016
7	0.602	0.609	0.605	0.008
8	0.605	0.609	0.607	0.004
9	0.607	0.609	0.608	0.002

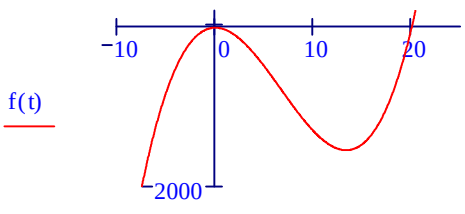
$roots(1, 2, g) =$

	0	1	2	3
0	1	2	1.5	1
1	1.5	2	1.75	0.5
2	1.5	1.75	1.625	0.25
3	1.625	1.75	1.688	0.125
4	1.688	1.75	1.719	0.063
5	1.719	1.75	1.734	0.031
6	1.719	1.734	1.727	0.016
7	1.719	1.727	1.723	0.008
8	1.719	1.723	1.721	0.004
9	1.719	1.721	1.72	0.002

$roots(2, 3, g) =$

	0	1	2	3
0	2	3	2.5	1
1	2.5	3	2.75	0.5
2	2.75	3	2.875	0.25
3	2.75	2.875	2.813	0.125
4	2.75	2.813	2.781	0.063
5	2.75	2.781	2.766	0.031
6	2.766	2.781	2.773	0.016
7	2.766	2.773	2.77	0.008
8	2.77	2.773	2.771	0.004
9	2.77	2.771	2.771	0.002

$f(t) := 1.3 \cdot t^3 - 26.013 \cdot t^2 + 0.975 \cdot t - 19.50975$



$\text{roots}(20, 21, f) =$

	0	1	2	3
0	20	21	20.5	1
1	20	20.5	20.25	0.5
2	20	20.25	20.125	0.25
3	20	20.125	20.063	0.125
4	20	20.063	20.031	0.063
5	20	20.031	20.016	0.031
6	20	20.016	20.008	0.016
7	20.008	20.016	20.012	0.008
8	20.008	20.012	20.01	0.004
9	20.01	20.012	20.011	0.002

(2) $\text{Bifid}(a, b, f) :=$

```
while |b − a| > 10^−5
    c ← (a + b)/2
    flag ← 1
    while min((f(a)·f(c) > 0), flag)
        flag ← 0
        a ← c
    while flag
        flag ← 0
        b ← c
c
```

$f(x) := 2x^3 + 3.5 \cdot x^2 + 1.9 \cdot x - 2.5$

$\text{Bifid}(0, 1, f) = 0.5583267$ $\quad\quad$ $\text{root}(f(x), x) = 0.55833309$