Modified False Position Method

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1 Question No.5

Algorithm 1 Modified False Position Method

procedure FALSE_POSITION($start\_point, end\_point, increment$)
a = start_point;
b = a + increment;
evaluate f(a);
evaluate f(b);

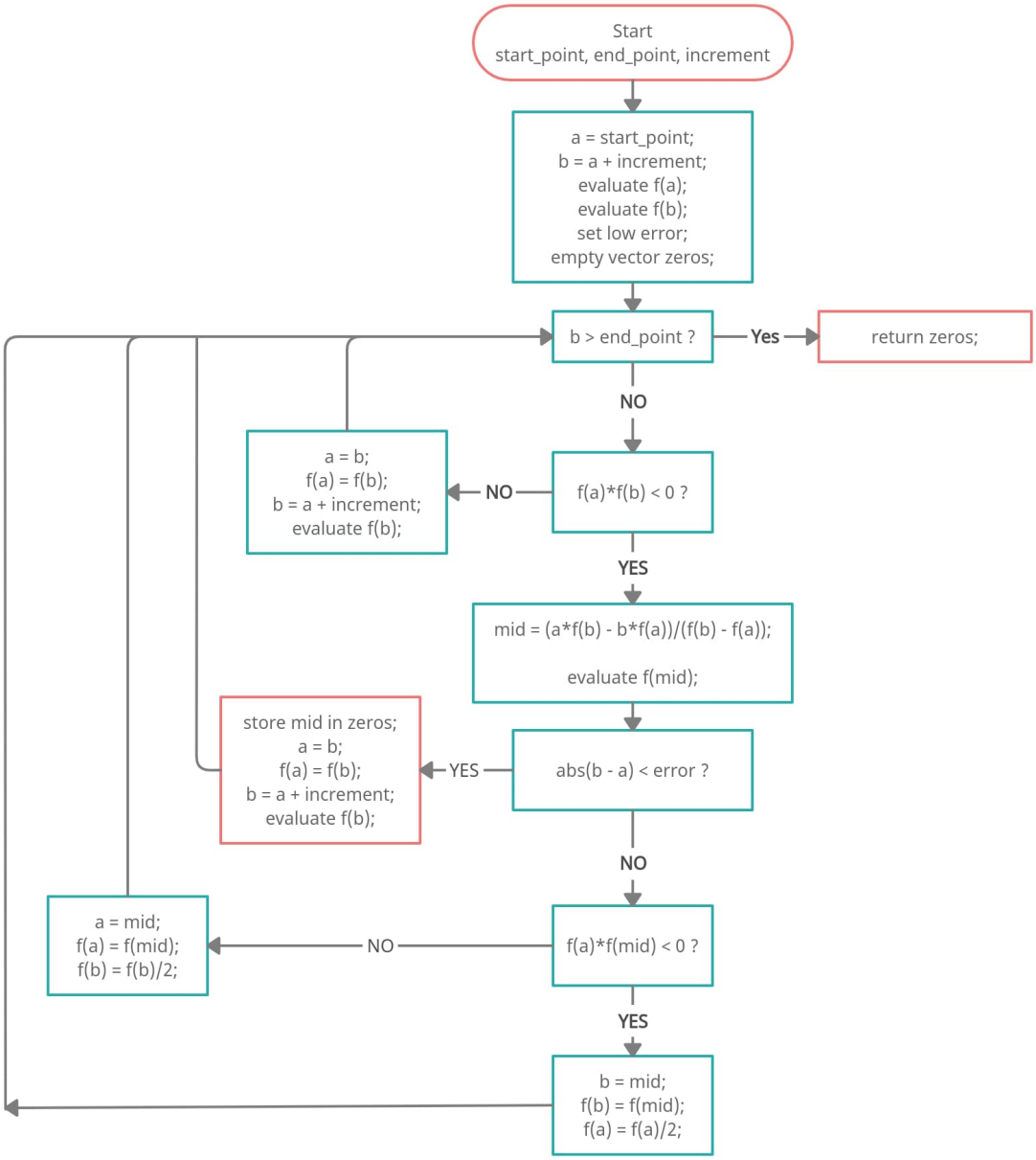
set very low error;
initialize empty vector zeros;

while ($b <= end\_point$) **do**
if ($f(a) * f(b) < 0$) **then**

$$mid = \frac{a * f(b) - b * f(a)}{f(b) - f(a)};$$

evaluate f(mid);
if ($abs(b - a) < error$) **then** ▷ Or when very close to zero
store mid in zeros;
a = b;
f(a) = f(b);
b = a + increment;
evaluate f(b);
else if ($f(mid) * f(a) < 0$) **then**
b = mid;
f(b) = mid;
f(a) = f(a)/2;
else
a = mid;
f(a) = f(mid);
f(b) = f(b)/2;
else
a = b;
f(a) = f(b);
b = a + increment;
evaluate f(b);
return zeros; ▷ empty zeros means no solution found

2 Flow Chart



3 Results

3.1 Problem a) xe^x

3.1.1 Parameters

start_point : -2
end_point : 2
increment : 4
ϵ : 10^{-9};

3.1.2 Output

root	function evaluations
9.65697×10^{-11}	38
Total	39

3.1.3 Observations

The algorithm found root in 38 iterations and terminated in 39 iterations.

3.2 Problem b) $x^3 - 2x + 1$

3.2.1 Parameters

start_point : -2
end_point : 2
increment : 0.5
ϵ : 10^{-9};

3.2.2 Output

root	function evaluations
-1.61803	31
0.618034	67
1	105
Total	107

3.2.3 Observations

The algorithm found first solution in 31 iterations then next in 36 iterations and third root in 38 iterations and terminated after 107 iterations.

3.3 Problem c) $sin(x) - \frac{1}{x}$

3.3.1 Parameters

start_point : -2
end_point : 2
increment : 0.5
ϵ : 10^{-9};

3.3.2 Output

root	function evaluations
-1.11416	33
1.60452×10^{-10}	92
1.11416	124
Total	126

3.3.3 Observations

1.60452×10^{-10} is not a solution to the problem. But because of the termination condition the algorithm treats the point as a solution. A check can be made to ignore this value i.e. only include the point if function value at that point is close to zero.