Bangladesh Army International University of Science & Technology (BAIUST)

Department of Computer Science and Engineering

Lab Report

Course No: CSE-312

Course Title: Numerical Analysis Sessional

Submitted to:

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Level :4 Term :2

Date of Submission: 21/01/2022

Teacher's Signature and Remarks

Experiment No: 1

Experiment Name : Find the roots of non-Linear equation using False-position method.

Objective: By applying the false-position method find the root of a non-linear equation.

Description:

Theoram: The method is also known as regular falsi method. It is the best method of finding the real root of an equation $f(x) = 0$ and in somewhat similar to the bisection method. Consider the equation $f(x) = 0$. Let a and b $(a < b)$ be two values of x such that $f(a)$ and $f(b)$ are of opposite signs. Then the graph of $y = f(x)$ crosses the x-axis at some point between a and b. Therefore, the equation of the chorel joining the two points $A [a, f(a)]$

and B $\left[b, f(b)\right]$ is —

$$y - f(a) = \frac{f(a) - f(b)}{a - b} \times (x - a) \quad\text{—①}$$

Now, $y = 0$

$$0 - f(a) = \frac{f(a) - f(b)}{a - b} \times (x - a)$$

$$\Rightarrow (x - a)\left\{f(a) - f(b)\right\} = -f(a)(a - b)$$

$$\Rightarrow (x - a) = \frac{-af(a) + bf(a)}{f(a) - f(b)}$$

$$\Rightarrow x = \frac{-af(a) + bf(a)}{f(a) - f(b)} + a$$

$$\Rightarrow x - a = \frac{-af(a) + bf(a) + af(a) - af(b)}{f(a) - f(b)}$$

$$\Rightarrow x = \frac{af(b) - bf(a)}{f(a) - f(b)}$$
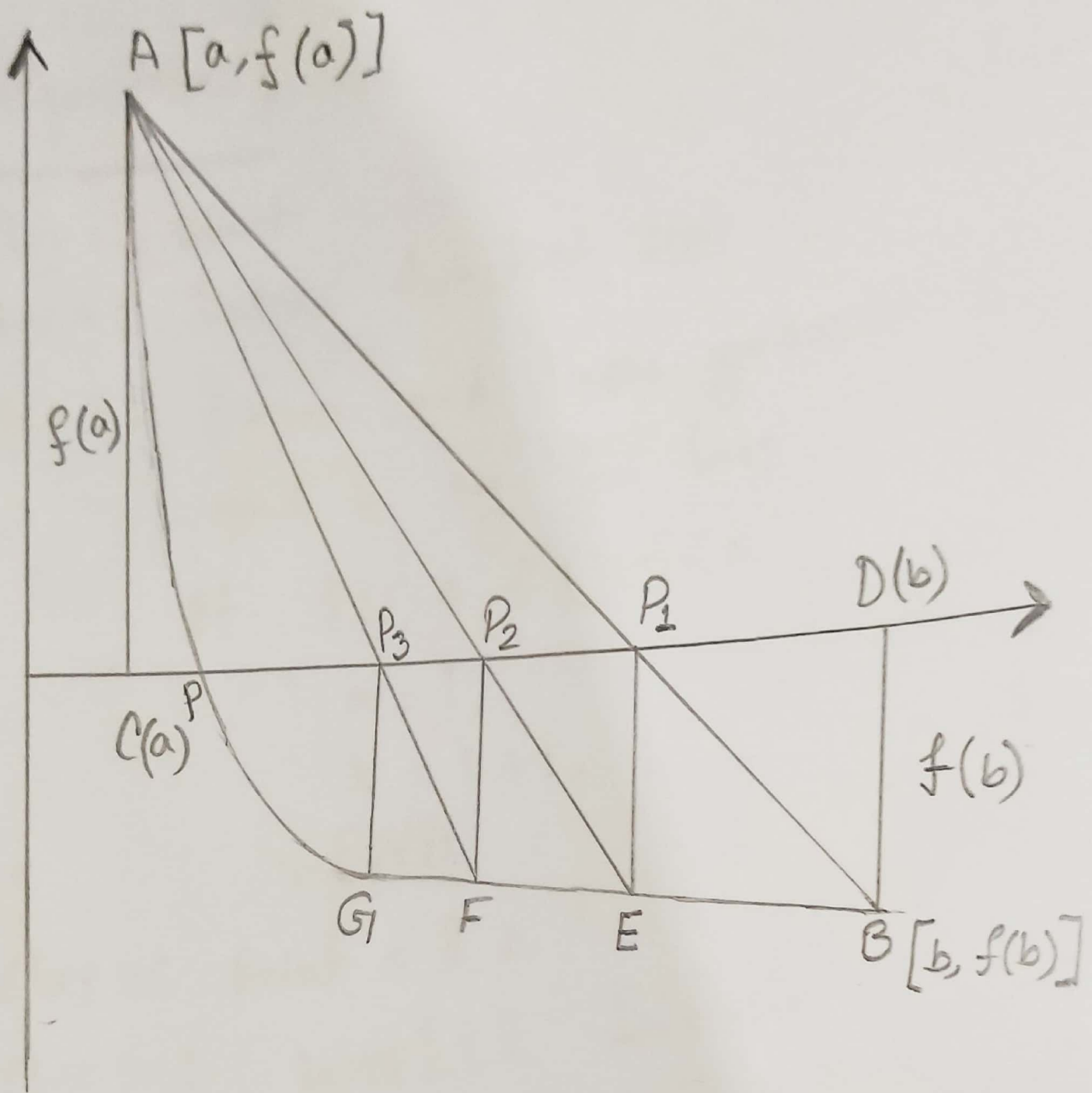
Which is the required formula.

$A\,[a, f(a)]$

$f(a)$

$C(a)$ ₚ ... P_3 P_2 P_1 $D(b)$

$f(b)$

G F E $B\,[b, f(b)]$

Figure: The geometrical Interpretation of the false-Position method.

Algorithm :

Step 1 : Start

Step 2 : Define function $f(x)$

Step 3 : Lower and Upper guesses a and b by for loop.

$$If \quad f(i) * f(i+1) < 0$$
$$a = i,$$
$$b = i+1,$$
$$END$$

Step 4 : Print a & b.

Step 5 : WHILE Infinite

$$x = b - (f(b) * (b-a))/(f(b) - f(a))$$
$$If \quad f(a) * f(x) < 0$$
$$b = x$$

$$Else$$
$$a = x$$
$$End$$

$$If \quad x - p < 0.001$$
$$break$$
$$END$$

Step 6 : print root as x

Source Code:

```
f = @(z) z^3 - 5*z -5 ;
for i = 1:10
    if f(i)*f(i+1)<0
        a = i;
        b = i+1;
    end

end
fprintf('Root lies between %d and %d\n\n',a,b);
p = 0;
c = 1;
while 1
    z = (a*f(b)-b*f(a))/(f(b)-f(a));
    if f(a)*f(z) < 0
        a = z;
    else
        b = z;
    end
    fprintf('z%d is %.4f\n',c,z);
    if z-p < 0.001
        break
    end
    p = z;
    c=c+1;
end
fprintf('\nThe value is %0.4f\n', z);
```

Output:

```
FL_M
Root lies between 2 and 3


z1 is 2.5000

z2 is 2.6829

z3 is 2.6237


The value is 2.6237
```

Step 7: Stop

Discussion:

In mathematics, the regula falsi, method of false position, or false position method is a very old method for solving an equation with one unknown, this method, in modified form, is still in use. In simple terms, the method is the trial-and-error technique of using test ("false") values for the variable and then adjusting the test value according to the outcome. This is sometimes also referred to as "guess and check", version of the method predate the advent of algebra and the use of equations.