

### Online: False position method

#### Full Marks: 10

In this assignment, you will implement the false position method for finding roots of a non-linear equation. False position method has three steps:

Step 1: Find two initial guesses  $x_L$  and  $x_U$  such that  $f(x_L) * f(x_U) < 0$ . [Same as in bisection method]

Step 2: Find  $x_r$  as the estimate of the root where  $(x_r, 0)$  is the intersecting point between the x-axis and the line connecting the points  $(x_L, f(x_L))$  and  $(x_U, f(x_U))$ . Please see Fig. 1. The equation for finding  $x_r$  can be obtained by calculation as:

$$x_r = \frac{x_U f(x_L) - x_L f(x_U)}{f(x_L) - f(x_U)}$$

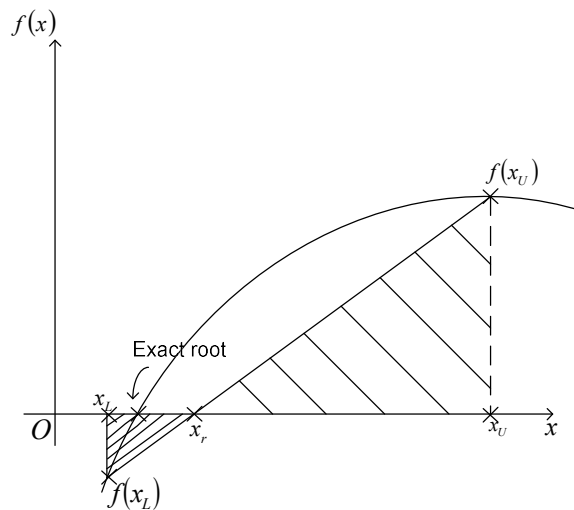


Fig. 1: False position method

Step 3: If  $f(x_L) * f(x_r) > 0$ , then  $[x_r, x_U]$  is chosen as the interval which contains the root; otherwise  $[x_L, x_r]$  is chosen. [Same as in bisection method]

Steps 2 and 3 continue until error reaches below some threshold.

**Use the false position method to output all real roots of the equation  $x^3 - x - 1 = 0$**

**Show graph of the function and explain how you have chosen your initial guesses. Also show error after every iteration.**