5- Secant method :-

This method is similar to the false position method, a general formula of this method is defined by:

$$x_{i+1} = x_i - \frac{f(x_i)(x_i - x_{i-1})}{f(x_i) - f(x_{i-1})}$$

Example 1: By the Secant method, find the approximate value of the root for the following equation: $x \ln x - 1 = 0$ in the interval $[2,3]$, corret to $|f(x_{i+1})| < 0.001$?

Solution :-

$$f(x) = x \ln x - 1, \quad [2,3], \quad |f(x_{i+1})| < 0.001$$

$x_0 = 2 \Rightarrow f(x_0) = 0.386$

$x_1 = 3 \Rightarrow f(x_1) = 2.296$

$$x_2 = x_1 - \frac{f(x_1)(x_1 - x_0)}{f(x_1) - f(x_0)} = 1.798 \Rightarrow f(x_2) = 0.055$$

$$x_3 = x_2 - \frac{f(x_2)(x_2 - x_1)}{f(x_2) - f(x_1)} = 1.769 \Rightarrow f(x_3) = 0.004$$

$$x_4 = x_3 - \frac{f(x_3)(x_3 - x_2)}{f(x_3) - f(x_2)} = 1.767$$

$\Rightarrow f(x_4) = 0.0003$

$\therefore |f(x_4)| = |0.0003| < 0.001$

$\therefore$ The root $\bar{x} = 1.767$

Exercises:-

Find approximate value of the root for the following equation:

$x^3 - 20 = 0$, $x_0 = 4$, $x_1 = 5.5$ Correct to two loops?