$$f(x) = 2\cosh x \sin x - 1$$

$$now\ f(x_0) = 2\cosh x_0 \sin x_0 - 1$$
$$= 2\cosh 0.4 \sin 0.4 - 1$$
$$= 2 \times 1.081 \times 0.3894 - 1 = -0.1580$$
$$f(x_1) = 2\cosh x_1 \sin x_1 - 1$$
$$= 2\cosh 0.5 \sin 0.5 - 1$$
$$= 2 \times 1.1276 \times 0.4794 - 1 = 0.0811$$

$$x_2 = \frac{x_0 f(x_1) - x_1 f(x_0)}{f(x_1) - f(x_0)}$$
$$= \frac{0.4 \times 0.0811 - 0.5 \times -0.1580}{0.0811 + 0.1580} = \frac{0.03244 + 0.979}{0.2391} = 0.4661$$

$$f(x_2) = 2\cosh x_2 \sin x_2 - 1$$
$$= 2\cosh 0.5 \sin 0.5 - 1$$
$$= 2 \times 1.1106 \times 0.4494 - 1 = -0.0811$$

$$x_3 = \frac{x_1 f(x_2) - x_2 f(x_1)}{f(x_2) - f(x_1)}$$
$$= \frac{0.5 \times -0.018 - 0.4661 \times 0.0811}{-0.0018 - 0.081} = \frac{0.009 - 0.0378}{-0.0828} = 0.4668$$

$$f(x_3) = 2\cosh x_3 \sin x_3 - 1$$
$$= -0.00009$$

$$x_4 = \frac{x_2 f(x_3) - x_3 f(x_2)}{f(x_3) - f(x_2)}$$
$$= \frac{0.4661 \times -0.00009 - 0.4668 \times -0.0018}{-0.00009 + 0.0018} = \frac{-0.000042 + 0.00048}{-0.00171} = 0.4667$$

Comparison:

In secant method, we do not check whether the root lies in between two successive approximates *X*n-1, and *X*n.
This checking was imposed after each iteration, in Regula –Falsi method.

Muller's Method

In *Muller's method*, f (x) = 0 is approximated by a second degree polynomial; that is by a quadratic equation that fits through three points in the vicinity of a root. The roots of this quadratic equation are then approximated to the roots of the equation $f(x)$ 0.This method is iterative in nature and does not require the evaluation of derivatives as in Newton-

Raphson method. This method can also be used to determine both real and complex roots of f (x) = 0.
Suppose, x_{i-2}, x_{i-1}, x_i
be any three distinct approximations to a root
Of f (x) = 0.

$f(x_{i-2}) = f_{i-2}, f(x_{i-1}) = f_{i-1}$

$f(x_i) = f_i.$

Noting that any three distinct points in the (x, y)-plane uniquely; determine a polynomial of second degree.
A general polynomial of second degree is given by
Noting that any three distinct points in the (x, y)-plane uniquely; determine a polynomial of second degree.
A general polynomial of second degree is given by

$f(x) = ax^2 + bx + c$

Suppose, it passes through the points

$(x_{i-2}, f_{i-2}), (x_{i-1}, f_{i-1}), (x_i, f_i)$

Then the following equations will be satisfied

$$ax_{i-2}^2 + bx_{i-2} + c = f_{i-2}$$
$$ax_{i-1}^2 + bx_{i-1} + c = f_{i-1}$$
$$ax_i^2 + bx_i + c = f_i$$

Eliminating a, b, c, we obtain

$$\begin{vmatrix} x^2 & x & 1 & f \\ x_{i-2}^2 & x_{i-2} & 1 & f_{i-2} \\ x_{i-1}^2 & x_{i-1} & 1 & f_{i-1} \\ x_i^2 & x_i & 1 & f_i \end{vmatrix} = 0$$

This can be written as

$$f = \frac{(x - x_{i-1})(x - x_i)}{(x_{i-2} - x_{i-1})} f_{i-2} + \frac{(x - x_{i-2})(x - x_i)}{(x_{i-1} - x_{i-2})(x_{i-1} - x_i)} f_{i-1} + \frac{(x - x_{i-2})(x - x_{i-1})}{(x_i - x_{i-2})(x_i - x_{i-1})} f_i$$

We further define