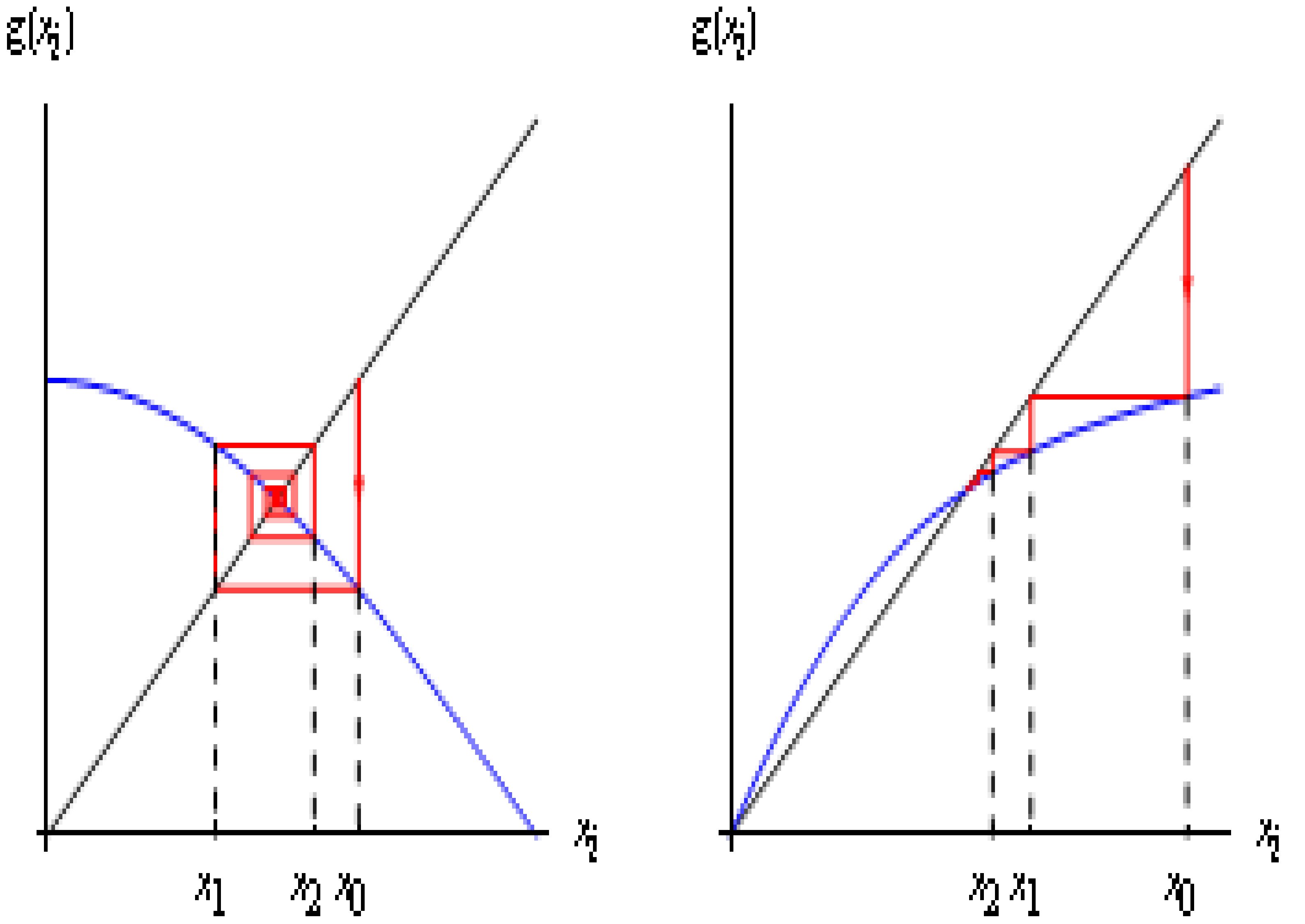
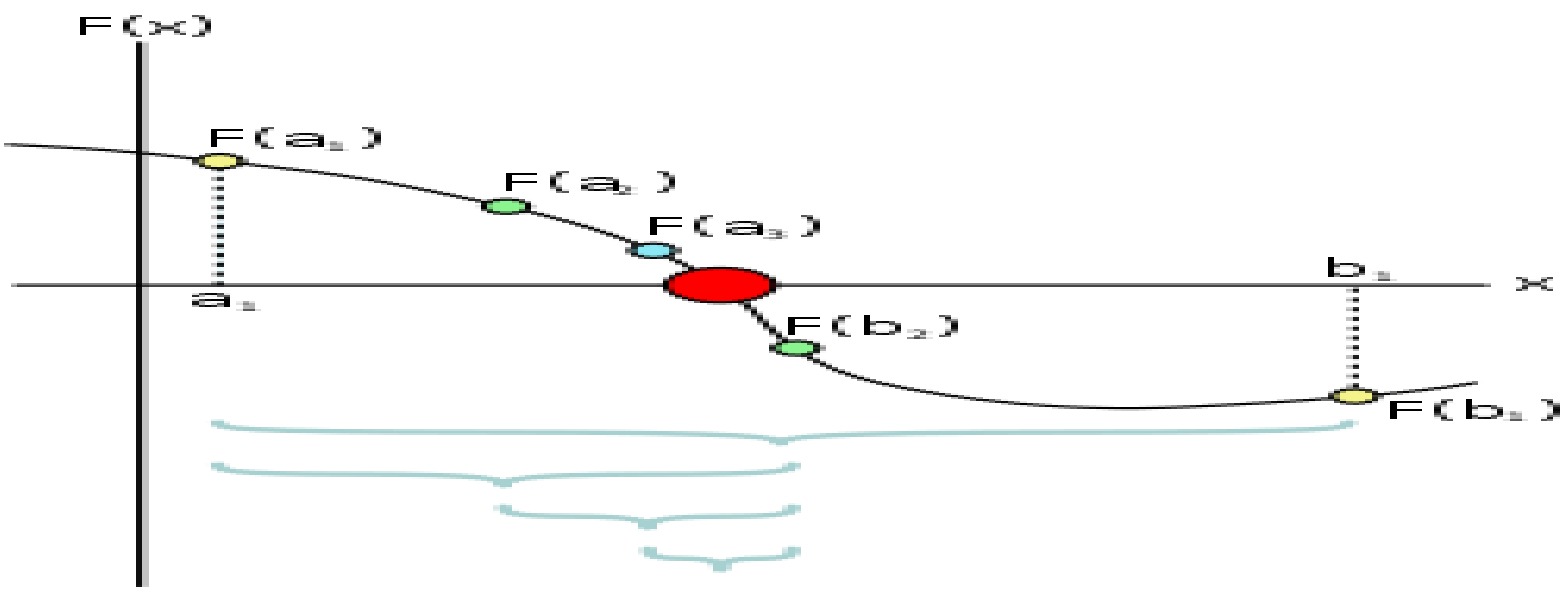
# Iteration method

In computational mathematics, an **iterative method** is a mathematical procedure that generates a sequence of improving approximate solutions for a class of problems, in which the n-th approximation is derived from the previous ones. A specific implementation of an iterative method, including the termination criteria, is an algorithm of the iterative method. An iterative method is called **convergent** if the corresponding sequence converges for given initial approximations.. In the problems of finding the root of an equation (or a solution of a system of equations), an iterative method uses an initial guess to generate successive approximations to a solution.



g(x_i)
x_i
x_1
x_2
x_0
g(x_i)
x_i
x_2
x_1
x_0

The **bisection method** in mathematics is a root-finding **method**that repeatedly bisects an interval and then selects a subinterval in which a root must lie for further processing. ... The **method** is also called the interval halving **method**, the binary search **method**, or the dichotomy **method**.



## Bisection Method Algorithm:

Start

Read x1, x2, e

*Here x1 and x2 are initial guesses

e is the absolute error i.e. the desired degree of accuracy*

Compute: f1 = f(x1) and f2 = f(x2)

If (f1*f2) > 0, then display initial guesses are wrong and goto (11).

Otherwise continue.

x = (x1 + x2)/2

If ( [ (x1 – x2)/x ] < e ), then display x and goto (11).

* Here [ ] refers to the modulus sign. *

Else, f = f(x)

If ((f*f1) > 0), then x1 = x and f1 = f.

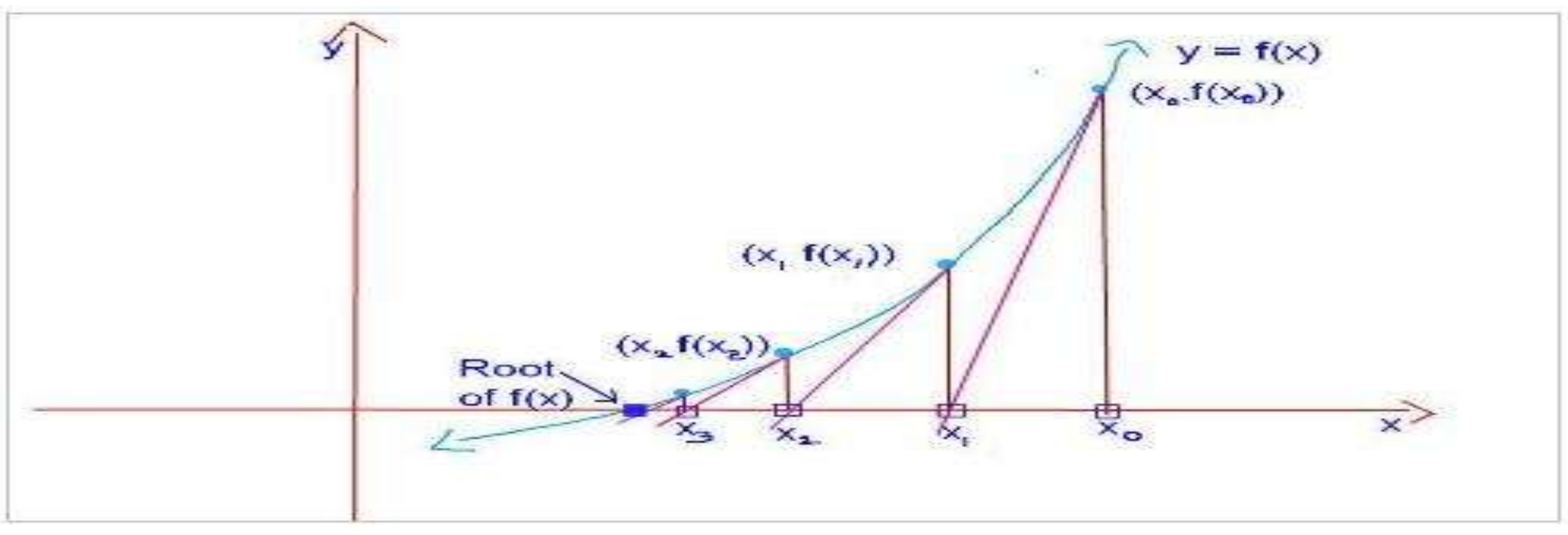
Else, x2 = x and f2 = f.

Goto (5).

*Now the loop continues with new values.*

Stop

In numerical analysis, **Newton's method** (also known as the **Newton–Raphson method**), named after Isaac**Newton** and Joseph **Raphson**, is a **method** for finding successively better approximations to the roots (or zeroes) of a real-valued function. It is one example of a root-finding algorithm.



**GAUSS ELIMINATION METHOD:**

To perform row reduction on a matrix, one uses a sequence of elementary row operations to modify the matrix until the lower left-hand corner of the matrix is filled with zeros, as much as possible. There are three types of elementary row operations: 1) Swapping two rows, 2) Multiplying a row by a non-zero number, 3) Adding a multiple of one row to another row. Using these operations, a matrix can always be transformed into an upper triangular matrix, and in fact one that is in row echelon form. Once all of the leading coefficients (the left-most non-zero entry in each row) are 1, and every column containing a leading coefficient has zeros elsewhere, the matrix is said to be in reduced row echelon form. This final form is unique

$$T = \begin{bmatrix} a & * & * & * & * & * & * & * & * \\ 0 & 0 & b & * & * & * & * & * & * \\ 0 & 0 & 0 & c & * & * & * & * & * \\ 0 & 0 & 0 & 0 & 0 & 0 & d & * & * \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & e \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$