Numerical Method Topic - Secant Method

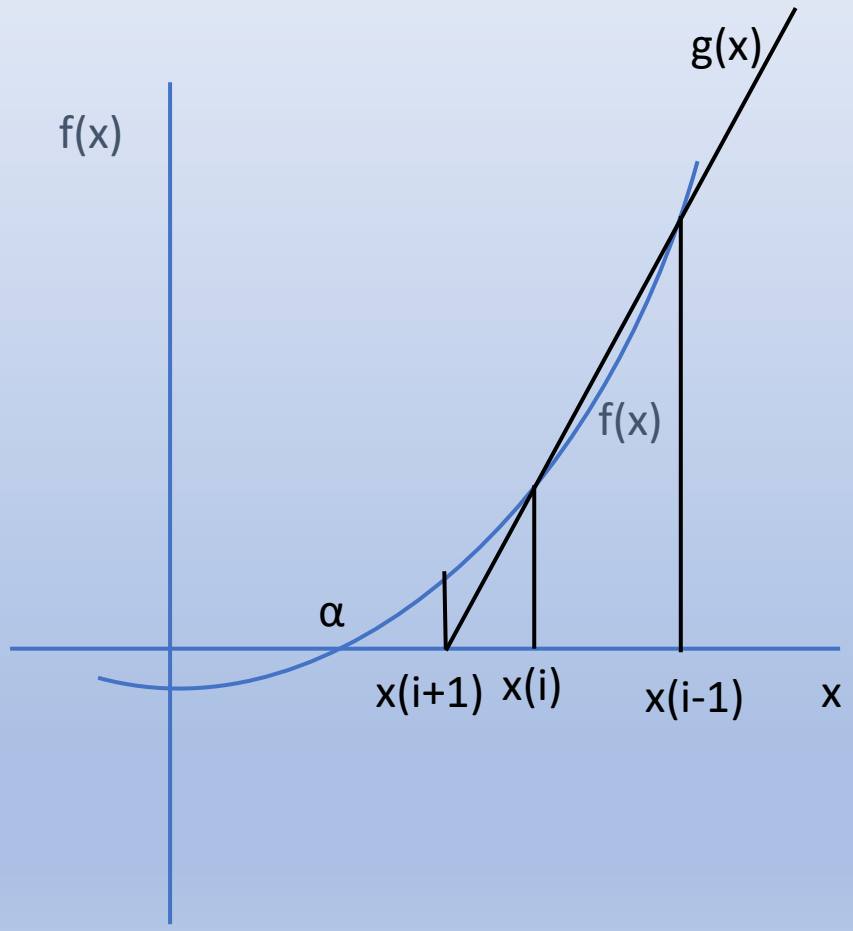
Objectives

- Solve a nonlinear equation using Secant Method
- Although Newton's method is a popular method, the method requires the derivative of the function f(x) to be evaluated.
- When the derivative is not easy to evaluate, Secant method can be used.
- Secant method belongs to a group called open domain methods.
- The nonlinear equation, f(x) = 0, could be an algebraic equation, a transcendental equation etc

- Examples of nonlinear equations:

- f (x) = x^3 - 2*x^2 - 2*x + 1;
- f (x) = exp(x) - 2*x - 2;

Secant Method - Algorithm



- g'(x(i)) = slope of f(x) = $\frac{f(x(i))-f(x(i-1))}{x(i)-x(i-1)}$
- $\frac{f(x(i+1))-f(x(i))}{x(i+1)-x(i)}$ = g'(x(i))
- f(x(i+1)) = 0
- x(i+1) = x(i) − $\frac{f(x(i))}{g'(x(i))}$
- Iteration stopping criteria
- |x(i+1) − x(i)| <= ε1
- |f(x(i+1))| <= ε2

Secant Method - Algorithm

- Examples:
- f (x) = x^3 - 2*x^2 - 2*x + 1;   f (x) = exp(x) - 2*x - 2;
- $g'(x(i)) = \frac{f(x(i)) - f(x(i-1))}{x(i) - x(i-1)}$
- $x(i+1) = x(i) - \frac{f(x(i))}{g'(x(i))}$

Summary

In this video,

- We presented Secant method to solve non-linear equations.
- Secant method belongs to a group called open domain methods.
- Secant method does not require the derivative of the function f(x) to be evaluated.
- Secant method requires two initial points to start the iteration process.