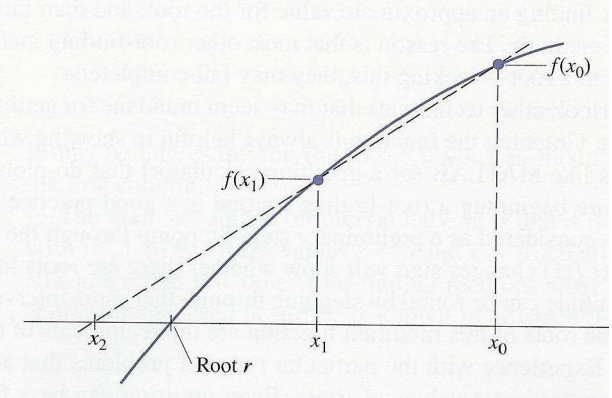

Figure 1: Graphical illustration of the Secant Method.

QUIZ 2

1. **Describe Secant method as a linear interpolation method, briefly.**

   - As Figure 1 illustrates, we draw the line through these two points and find where it intersects the x-axis.
   - The intersection of the line with the x-axis is not at $x = r$ but it should be close to it. From the obvious similar triangles we can write

     $$\frac{(x_1 - x_2)}{f(x_1)} = \frac{(x_0 - x_1)}{f(x_0) - f(x_1)} \Longrightarrow x_2 = x_1 - f(x_1)\frac{(x_0 - x_1)}{f(x_0) - f(x_1)}$$

     and the general term:

     $$x_{n+1} = x_n - f(x_n)\frac{(x_{n-1} - x_n)}{f(x_{n-1}) - f(x_n)}$$

2. **Describe Newton's method for solving nonlinear eqns, briefly.**

   - Like the previous ones, this method is also based on a linear approximation of the function, but does so using a tangent to the curve. Figure 2 gives a graphical description
   - The calculation scheme follows immediately from the right triangle shown in Fig. 2.

     $$tan\theta = f^{'}(x_0) = \frac{f(x_0)}{x_0 - x_1} \Rightarrow x_1 = x_0 - \frac{f(x_0)}{f^{'}(x_0)}$$

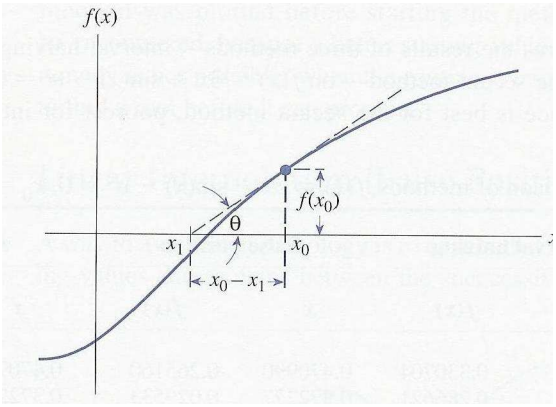

Figure 2: Graphical illustration of the Newton's Method.

and the general term is:

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}, n\ 0, 1, 2, \ldots$$

- Newton's algorithm is widely used because, it is more rapidly convergent than any of the methods discussed so far.