Algorithm

The steps of the Newton-Raphson method to find the root of an equation $f(x)=0$ are

1. Evaluate $f'(x)$ symbolically

2. Use an initial guess of the root, x_i, to estimate the new value of the root, x_{i+1}, as

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

3. Find the absolute relative approximate error $\left|\epsilon_a\right|$ as

$$\left|\epsilon_a\right| = \left|\frac{x_{i+1} - x_i}{x_{i+1}}\right| \times 100$$

4. Compare the absolute relative approximate error with the pre-specified relative error tolerance, ϵ_s. If $\left|\epsilon_a\right| > \epsilon_s$, then go to Step 2, else stop the algorithm. Also, check if the number of iterations has exceeded the maximum number of iterations allowed. If so, one needs to terminate the algorithm and notify the user.
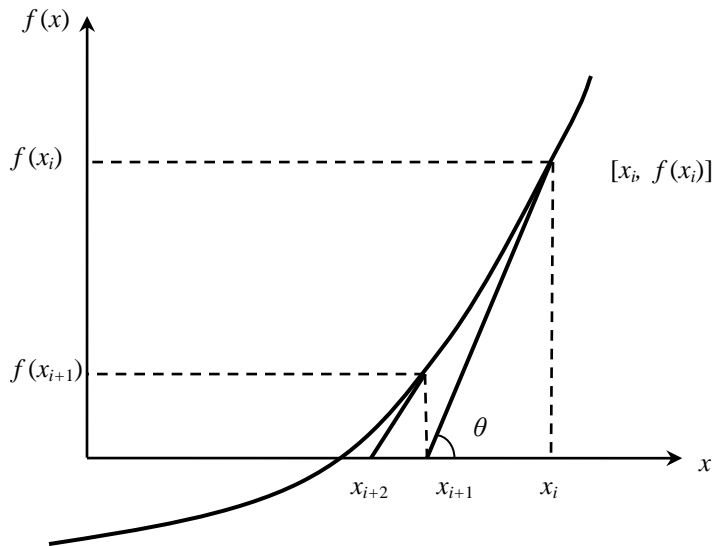

Figure 1 Geometrical illustration of the Newton-Raphson method.