Open Method

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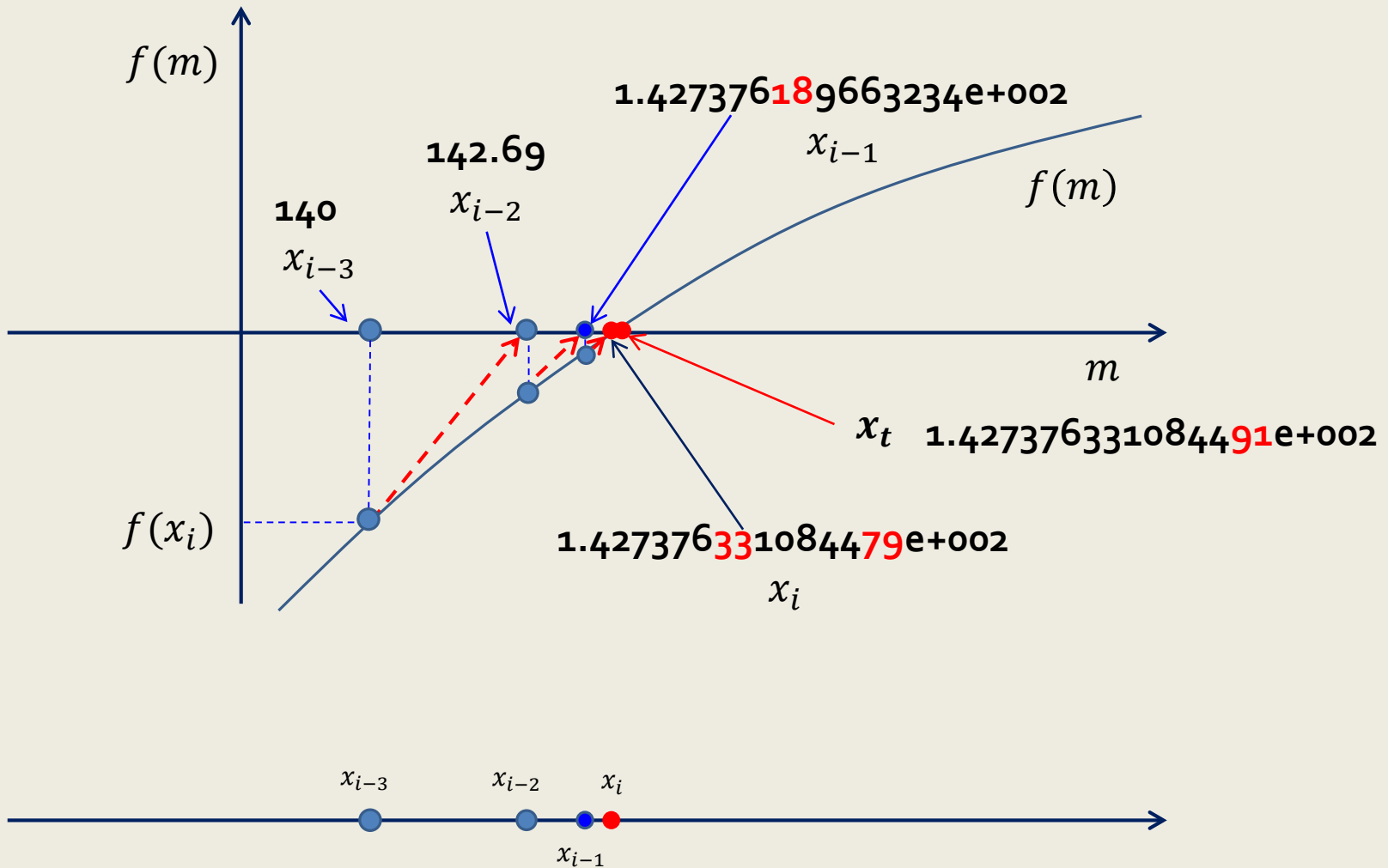
Secant Method

Problem of Newton-Raphson

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

A potential problem in implementing the Newton-Raphson method is the evaluation of the derivative.

$$f(m) = \sqrt{\frac{gm}{c_d}} \cdot tanh\left(\sqrt{\frac{gc_d}{m}} \cdot t\right) - 36$$

$$f'(m) = \frac{1}{2} \cdot \sqrt{\frac{g}{mc_d}} \cdot tanh\left(\sqrt{\frac{gc_d}{m}} \cdot t\right) - \frac{gt}{2m} \cdot sech^2\left(\sqrt{\frac{gc_d}{m}} \cdot t\right)$$
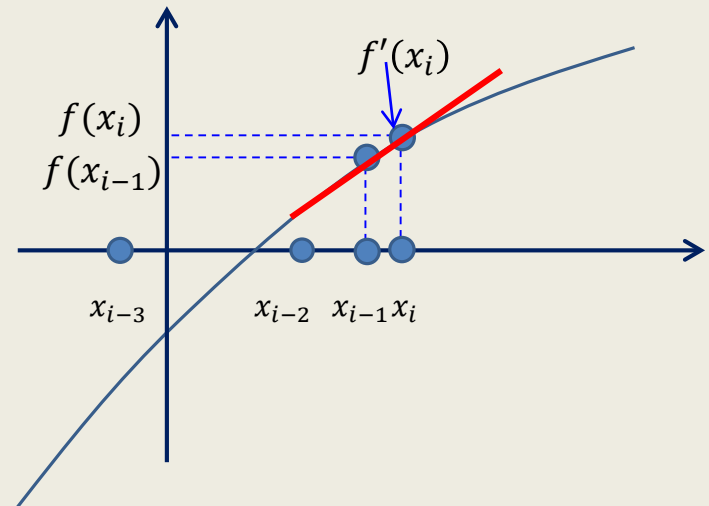
Newton-Raphson

Secant Method

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

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

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

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

Modified Secant Method

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

$$f'(x_i) \cong \frac{f(x_i + \delta x_i) - f(x_i)}{\delta x_i}$$

$$\delta x_i = x_{i-1} - x_i$$

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

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