Newton's Method

2.1.19

Suppose $f(x)$ is a function with unique root x^* in $[a,b]$.
Let x_0 be a "good" initial approximation.

$$x_{k+1} = x_k - \frac{f(x_k)}{f'(x_k)}$$

example) Find the Newton's Method formula for $f(x) = x^3 + x - 1 = 0$.

$$x_{k+1} = x_k - \frac{[x_k^3 + x_k - 1]}{[3x_k^2 + 1]} = \frac{x_k(3x^2+1) - x_k^3 - x_k + 1}{3x_k^2+1} \Rightarrow \frac{2x_k^3 + 1}{1 + 3x_k^2}$$