

M/CS 375 HW 4

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Solve $f(x) = x$ using Newton's iteration with an initial $x_0 \neq 0$.

$$\begin{aligned}x_0 &= 0.5 \\x_1 &= 0.5 - \frac{f(0.5)}{f'(0.5)} \\&= 0.5 - \frac{0.5}{1} \\&= 0\end{aligned}$$

(a) What are the errors e_1 and e_2 ?

$$\begin{aligned}\lim_{i \rightarrow \infty} \frac{e_{i+1}}{e_i^c} &= \frac{1}{2} \left| \frac{f''(r)}{f'(r)} \right| \\&= \frac{1}{2} \left| \frac{0}{1} \right| = 0 \\e_1 &= e_2 = 0\end{aligned}$$

(b) Explain why the result from (a) indicates a faster than linear convergence.

The error jumping immediately to zero indicates that the error is decreasing faster than linearly.