Verify Quad order on convergence for Newton

$$|e_{n+1}| \approx \mu |e_n|^2$$

Recall $e_n = x_n - \xi$ but what's ξ.

- One idea... run Newton to convergence to find ξ. and then go back to check the order.

- $e_n \approx x_n - x_{n+1}$ in comparison to x_n the next iterate is close enough to see the order...

- Try to verify the

$$|e_{n+1}| \approx \mu |e_n|^2$$

$$\log|e_{n+1}| \approx \log\mu + 2\log|e_n|$$

when e_n is small $\log|e_n| \to -\infty$

$$2 \approx \frac{\log|e_{n+1}| - \log\mu}{\log|e_n|}$$

negligible as $n \to \infty$

$$2 \approx \frac{\log|e_{n+1}|}{\log|e_n|} \approx \frac{\log|x_{n+1} - x_{n+2}|}{\log|x_n - x_{n+1}|}$$ for large n

- Compute this and check it's close to zero.
- Use arb precision so can check a numbers of iterations.