MATH 417 502
Homework 2

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August 28, 2024

Problem 1

a.) Requirements to converge quadratically:

$$g'(x*) = 0$$
$$g''(x) \leq M$$

In our case, from newton's method:

$$g(x) = x - \frac{e^x - x - 1}{e^x - 1}$$

Thus we have:

$$\begin{aligned} g'(x) &= 1 - (\frac{e^x - 1}{e^x - 1})(-e^x(\frac{e^x - x - 1}{(e^x - 1)^2}) \\ &= 1 + e^x(\frac{e^x - x - 1}{(e^x - 1)^2}) \\ g'(0) &= 1 + 1(\frac{1 - 0 - 1}{(1 - 1)^2}) \\ &= 1 + \frac{0}{0} \end{aligned}$$

So $g'(0)$ is undefined, and thus does not satisfy the condition for quadratic convergence.