Math 5601 Homework 2

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Problem 1.

Let $R > 0$, and define $f(x) = 1 - \frac{1}{Rx}$ for $x > 0$. Then clearly $f(x) = 0$ if and only if $x = \frac{1}{R}$, so calculating a zero of f is equivalent to calculating the reciprocal of R.

Let $\{x_k\}$ be the sequence of approximate solutions of $f(x) = 0$ obtained by using Newton's method. Then, by definition,

$$x_{k+1} = x_k - \frac{f(x_k)}{f'(x_k)} = x_k - \left(1 - \frac{1}{Rx_k}\right) \cdot Rx_k^2 = x_k - Rx_k^2 + x_k = x_k(2 - Rx_k) \tag{1}$$

Problem 2.