CSE 218
Online 1 - B2
Time: 30 Minutes

Assume that your programming language supports only addition, subtraction, and multiplication, but does not support division. To support division of $\frac{a}{b}$, we only need to know the value of $\frac{1}{b}$. We can then evaluate the expression $\frac{a}{b}$ using multiplication of a and $\frac{1}{b}$. We can use a numerical method approach to evaluate $\frac{1}{b}$ as follows.

Assume $x = \frac{1}{b}$ which implies $b = \frac{1}{x}$. Then consider the function $f(x) = b - \frac{1}{x}$. Now, transform the update equation ($i.e.$, $x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}$) of Newton-Raphson method such that it does not contain any division operation (which is not supported by your programming language anyway).

Use your method to compute x for $b = 1.37$ for an error precision of at most $\epsilon_s = 0.05\%$. Show the graph of $f(x)$ and explain how you chose the initial guess.