PH 354: hw 2, problem 4

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Fixed point Iteration method: It is a non-linear root finding method starting from an initial guess value. The root of the equation at hand is found out by improving on the guess value with each iteration.
For an equation of the form

$$x = f(x)$$

the iterative recipe to get the root is

$$x_{n+1} = f(x_n)$$

However accelerated Fixed point iteration method improves on the previous procedure to achieve faster convergence.
Steffensen's method: This is a good accelerated fixed point method for root finding. It has a fast convergence compared to non accelerated one. It is similar to Newton-Raphson method with an additional advantage that it doesn't involve evaluating any derivatives. The recipe is as follows,

$$x_{n+1} = x_n - \frac{f(x_n) - x_n}{g(x_n)}$$

where $g(x_n)$ is given by

$$g(x_n) = \frac{f(f(x_n)) - f(x_n)}{f(x_n) - x_n} - 1$$