CSE 330 [Numerical Methods]
Assignment 04

Total Marks: 25

1. Consider a function $f(x) = x^3 + x^2 - 4x - 4$.

(a) (5 marks) State the exact roots of f(x) and construct two different fixed point functions g(x) such that f(x) = 0.

(b) (5 marks) Compute the convergence rate of each fixed point function g(x) obtained in the previous part, and state which root it is converging to or diverging.

2. Consider the following function: $f(x) = xe^x - 1$.
(a) (5 marks) Find solution of f(x) = 0 up to 5 iterations using Newton's method starting with $x_0 = 1.5$. Keep up to four significant figures.

(b) (5 marks) Consider the fixed point function, $g(x) = \frac{2x+1}{\sqrt{x+1}}$. Show that to be super-linearly convergent, the root must satisfy $x^* = \frac{-3}{2}$.

3. (5 marks) Consider a cubic function, $f(x) = 2x^3 - 2x - 5$. Compute a **superlinearly convergent fixed point function g(x)** for the given function f(x) using **Newton's method.**