Instructions for preparing the solution script:

- Write your name, ID#, and Section number clearly in the very front page.
- Write all answers sequentially.
- Start answering a question (not the part of the question) from the top of a new page.
- Write legibly and in orderly fashion maintaining all mathematical norms and rules. Prepare a single solution file.
- Start working right away. There is no late submission form. If you miss the deadline, you need to use the make-up assignment to cover up the marks.

---

1. (4 marks) Consider the function $f(x) = x^3 - x^2 - 4x + 4$. This function has three roots, and one root is $x_\star = 1$. Answer the following:
   (a) (4 marks) Find the remaining two exact roots of the function $f(x)$ algebraically (that is, not by using the numerical method).
   (b) (4 marks) Construct two different fixed point functions $g(x)$ such that $f(x) = 0$.
   (c) (12 marks) Compute the convergence rate, λ, for each fixed point function $g(x)$ obtained in the previous part, and state which root it is converging to or diverging.
2. (10 marks) Construct the superlinear fixed point function $g(x)$ for $f(x) = x^3 - x + \sin(x)$, and find the root within 10^{-5} starting with $x_0 = 1.5$ and state how many iterations are needed.