Home Work (2) - Numerical Analysis

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1 Home Work

- Find the zero-point of the function $f(x) = \sqrt{x^2+1} - 1$ using one of the methods we learn and explain why did you choose that one.
- Find all zero-points of the function $f(x, y) = x^2 + y^2$ using Bisection and Newton-Raphson methods.
- Given $x = \sqrt{s}$ is zero-point of the process $x_{n_1} = \phi(x_n)$ such that:

  $$\phi(x) = ax + \frac{b}{x} + \frac{c}{x^2}$$

  Find a, b, c so the method will be optimal.
- Given the following metohd: $x_{n+1} = x_n(2-_n)$. Find the zero-point of the method. Find the the converge order of the method.
- Given the following system of equations:

  $$x^2 + xy + y^2 - 2x - 2y = 0$$
  $$x^2 + y^2 - 2x = 0$$

  A) Make 2 iteration using multi-dimensional Newton-Raphson with starting guess: $(-0.5, 0.5)$.
  B) It is known that $(x, y) = (2, 0)$ is another solution. Explain why the method may has problems near this solution (Hint: not related to the first guess).
- Given the method $x_{n+1} = \sqrt[3]{3x_n + 1}$. Show that $p \in (1, 2)$ are fixed points for the method.
- Perform LU method on the following matrix: $\begin{pmatrix} 2 & 2 & 1 \\ 0 & 3 & 0 \\ 3 & 1 & 3 \end{pmatrix}$
- Solve using QR the following equation: $\begin{pmatrix} 1 & 0 & 2 \\ 0 & 3 & 0 \\ 4 & 5 & 6 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 5 \\ -2 \\ 3 \end{pmatrix}$