Write a Matlab function for Newton's metod. Use your Matlab function to solve the following problem to $\|\mathbf{x}^{(k)} - \mathbf{x}^{(k-1)}\|_\infty < 10^{-5}$.

$$
\begin{aligned}
4x_1 - x_2 + x_3 &= x_1 x_4, \\
-x_1 + 3x_2 - 2x_3 &= x_2 x_4, \\
x_1 - 2x_2 + 3x_3 &= x_3 x_4, \\
x_1^2 + x_2^2 + x_3^2 &= 1.
\end{aligned}
$$

Newton's Method for System of Nonlinear Equations

Given an initial approximation $\mathbf{x}$.

Algorithm

Step 1. Set $k = 1$.

Step 2. While $k \leq N$ do Steps 3-7.

- Step 3. Compute $\mathbf{F}(\mathbf{x})$ and $J(\mathbf{x})$.
- Step 4. Solve the $n \times n$ linear systems $J(\mathbf{x})\mathbf{y} = -\mathbf{F}(\mathbf{x})$.
- Step 5. Set $\mathbf{x} := \mathbf{x} + \mathbf{y}$.
- Step 6. If $\|\mathbf{y}\| < \varepsilon$ then output $\mathbf{x}$; Stop.
- Step 7. Set $k = k + 1$.

Step 8. Output("Maximum number of iterations exceeded"); Stop.