Problem 1 Use the method of characteristics to solve the problem

\[\begin{align*}
\partial_t u + x \partial_x u &= 0, \\
u(x,0) &= u_0(x).
\end{align*}\]

Problem 2 Consider the traffic flow problem seen in class

\[\begin{align*}
\partial_t u + \partial_x f(u) &= 0, \\
u(x,0) &= u_0(x).
\end{align*}\]

where \(f(u) = u_\infty(1 - \rho/\rho_\infty)\).

Solve the problem for three initial conditions of your choice using the Lax-Friedrichs scheme described in class and the MATLAB code provided. You should describe what you observe, relate this to your intuition about traffic and provide three pictures of the solution \((x, t, u)\).