

Name and Last name: _____

1. Explain why a given system of equations: $\begin{cases} \frac{\partial u_1}{\partial t} + 2\frac{\partial u_1}{\partial x} + \frac{\partial u_2}{\partial x} = 0 \\ \frac{\partial u_2}{\partial t} + 6\frac{\partial u_1}{\partial x} + 4\frac{\partial u_2}{\partial x} = 0 \end{cases}$,
is hyperbolic or not?

2. Calculate time and position at which discontinuity appears

$$\begin{cases} \frac{\partial U}{\partial t} + \frac{\partial}{\partial x}(-2u^2) = 0 \\ U(x, t = 0) = \begin{cases} 1 & |x| > 2 \\ x + 3 & x \in \langle -2, -1 \rangle \\ 2 & x \in \langle -1, 1 \rangle \\ -x + 3 & x \in \langle 1, 2 \rangle \end{cases} \end{cases}, \quad \boxed{t=}$$

3. For the equation of question 2, draw a solution for $t = 3$, assume initial condition: $U(x, t = 0) = \begin{cases} 1 & |x| > 1 \\ -1 & |x| < 1 \end{cases}$