

253 HW4.

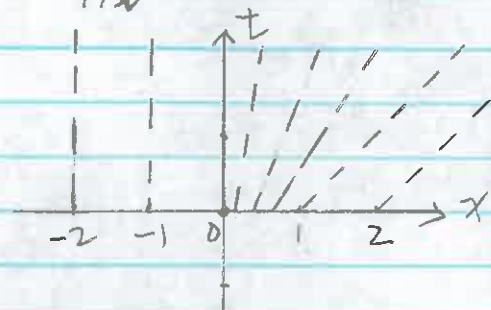
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1. (a). $x(t) = x_0 + (u_0(x_0))t$

when $x < 0$, $x(t) = x_0$

when $0 \leq x \leq 1$, $x(t) = x_0 + x_0 t$ $x_0 = \frac{x}{1+t}$ $t = (x(t) - x_0) \cdot \frac{1}{x_0}$

when $x > 1$, $x(t) = x_0 + t$

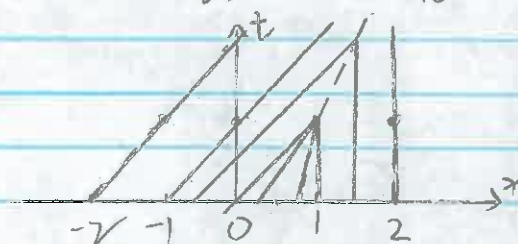


(b). $x(t) = x_0 + (u_0(x_0))t$

when $x < 0$, $x(t) = x_0 + t$

when $0 \leq x \leq 1$, $x(t) = x_0 + (1 - x_0)t$ $x_0 = \frac{x(t) - t}{1 - t}$ $t = \frac{x(t) - x_0}{1 - x_0}$

when $x > 1$, $x(t) = x_0$



(c) in (a) the characteristics don't intersect when $t > 0$
in (b) the characteristics intersect at $t = 1$.

2. (a) The speed $\frac{du}{dt}$ of $x < 0$ is larger than the speed of $x > 0$. This means the initial condition on the left is passing along with time much more quickly and collide with the condition on the right.

At $t = 0$, the shock happens at $x = 0$.

(b). The density on the left of the shock is u_l .

The density on the right of the shock is u_r .

At time 0, the shock is at $x_T = 0$;

At time T, the shock is at $x_T = ST$.