a) Note about solving ode's!
   How do you solve $dx/ds = x-y$ and $dy/ds = x+y$,
   $x(0) = z$ and $y(0) = 0$ ...? 
   **CANNOT DO SEPARATION OF VARIABLES!**

b) Example 3: $A_t + (0.5*Ax^2)_x = 0$, with $a > 0$ a constant, and
   $A = a$ for $x < 0$, $a > 1$, $t \to \infty$, get shock.
   $A = x$ for $0 < x < 1$, $a < 1$, $t \to \infty$, get rarefaction.
   $A = 1$ for $1 < x$

Note that there is always a shock starting at $x=t=0$. But for $a < 1$ this shock never reaches the $A = 1$ region, and becomes smaller and smaller as $t$ grows.

Draw solution [$A$ as a function of $x$] for typical values of $t$. 