Homework #1 for MATH 6395

Due at the beginning of class, Sep. 16th, 2013

Consider Burgers' equation

$$u_t + (u^2/2)_x = 0, \quad x \in \mathcal{R}$$

with initial condition $u_0(x) = \sin(x)$.

1. Find a maximum T^* before which the solution stays continuous for $t < T^*$.
2. Write a code to solve for $u(x,t)$ for $t < T^*$. Test your code to solve $u(x = 0.1, t = 0.1)$, $u(x = 0.5, t = 0.5)$.

   Hint: write down the characteristic equations (see eq.(13) in the note) and use Newton's method to solve for the roots of nonlinear characteristic equations.