Homework #10 **Computational Fluid Dynamics I** Prof. V. Esfahanian
Due Date: 4/3/97 TA: A.Bahrami & M.Fazli

1. What is the differences between 2D and 3D characteristic curves? and which of them physically exist?

2. Describe the conditions which shock wont be occurred in the Burgers equation.

3. What is the geometrical explanation of the characteristic curves of the below equation?

$$a(x,t,u)u_x + b(x,t,u)u_t = c(x,t,u)$$

4. Assume the below equation.

$$u_t + u_x = u$$

$$\text{I.C.} : u(x,1) = x - 2$$

   I) Parameterize the initial condition curve.

   II) Show the equation has an answer.

   III) Find the characteristic curves.

   IV) Solve the equation analytically.

5. Assume the Burgers equation ($u_t + uu_x = 0$) with the following boundary conditions; Calculate the weak solution ($t > 0$) and find the answer limitation when ϵ goes to zero.

$$u(x,0) = \begin{cases} 0 & x < 0 \\ x/\epsilon & 0 \le x \le \epsilon \\ 1 & x > \epsilon \end{cases}$$