Unified Engineering Fall 2007
Fluids Problem F8

A spatially-uniform velocity field has a constant unit x component, and a y component varying in time as follows:

$$\vec{V}(t) \;=\; 1\,\hat{\imath} \;+\; (1-t)\,\hat{\jmath}$$

a) Determine the pathline of a particle A emitted at the origin $x, y = (0, 0)$ at time $t = 0$. Determine the pathline of a particle B emitted at the origin $x, y = (1, 0)$ at time $t = 0$.

b) Sketch the pathlines on one plot. Will particles A and B collide?

c) Consider how a streakline emanating from $x, y = (0, 0)$, and starting at $t = 0$, develops in time for $t > 0$. Specifically, sketch this streakline as it appears at the four time snapshots $t = 1/2$, $t = 1$, $t = 3/2$, $t = 2$ (all on the same plot).