Problem 150M

A large volume of water (density 1000 kg/m^3, dynamic viscosity 10^{-3} $kg/m\ s$) is bounded on one side by an infinitely large flat plate. The water is initially at rest but at time $t = 0$ the plate is set in motion and thereafter moves in its own plane with a velocity of 1 m/s.

(a) How much time will pass before the fluid at a distance of 1 cm from the plate reaches a velocity of 0.5 m/s?

(b) At that time what is the ratio of the vorticity at the point 1 cm from the plate to the vorticity at the surface of the plate?