Non-Book Problem - For Fun Only

1) A solid cylinder of radius $a > 0$ and uniform density $\rho_s$ rolls from rest down an inclined plane of angle $\alpha > 0$ and length $L$ in a time $T_s$. A hollow cylinder of identical radius $a > 0$ is filled with an inviscid fluid of density $\rho_f$ and rolls from rest down the same plane in a time $T_f$. Determine the ratio $T_f/T_s$. 