**Closed Books and Notes**

1). (10 points) Consider creeping shear flow past the baffle depicted below. Using your intuition sketch the expected streamlines, paying particular attention to any areas of recirculation (eddies) and symmetry. Don't waste alot of time on this problem!
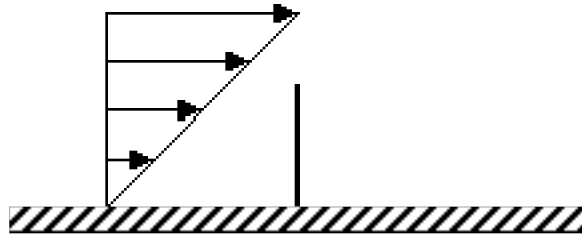
2). (10 points) Prove that $u_i^{(p)} = \dfrac{x_i}{2\,\mu}\,p$ is a particular solution to the Stokes flow equations where p is the (harmonic) pressure.

3). (20 points) Consider the 2-D flow of a ribbon of fluid confined between two plates moving with opposite velocity:
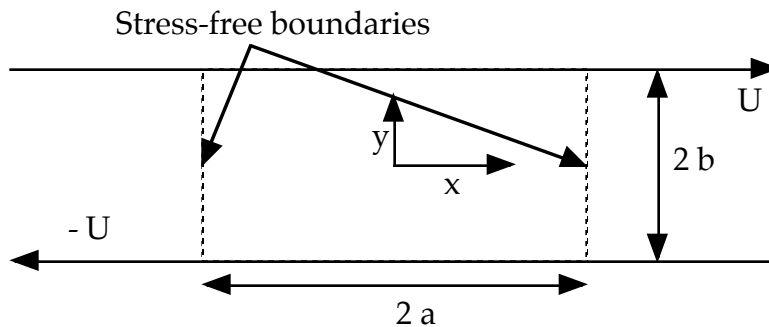
If the boundaries at x=±a are stress free, write down the general series solution to the problem making maximum use of symmetry. Determine all of the eigenvalues and all but the last set of coefficients explicitly (e.g., leave the solution in terms of some unknown coefficients A_m). Show how you would obtain these final coefficients, but don't evaluate the integrals.

4). (20 points) Consider the general linear shear flow $u_i = \Gamma_{ij}\, x_j$ past a sphere of radius a fixed at some position $x_i = y_i$ (not the origin). Show how to calculate the resulting disturbance pressure and velocity distributions. Do not determine the constants, but write down all equations necessary to get them. I want to see if you know how to solve this sort of problem if you have enough time. Hint: The decaying spherical harmonics are the derivatives of the fundamental singularity $\dfrac{1}{r}$.