1. For a gravity wave with surface elevation $\eta\ (x,t) = a\ e^{i(kx-\omega t)}$, find the pressure p at the bottom, $y = -h$. (Use linear theory and the same coordinate system used in class).

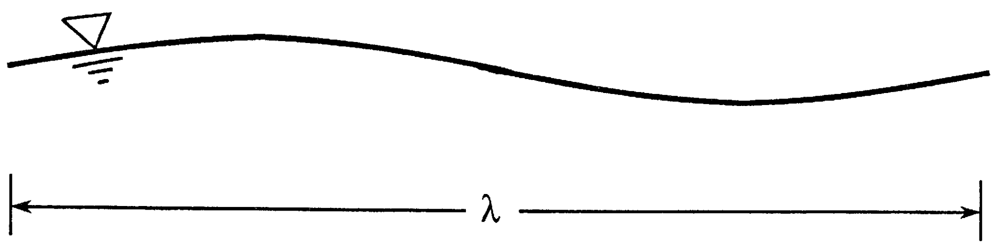
2. Two immiscible liquids have an interface at $y = 0$ and are confined between the boundaries $y = -h$ and $y = h$. If the upper liquid has a density ρ_1 and the lower liquid has density ρ_2, show that for the case where $h \rightarrow \infty$, the wave velocity c for gravity waves is given by
$c = [\ g\ (\rho_2 - \rho_1)\ /k\ ((\rho_2 + \rho_1)]^{1/2}$.

3. Small amplitude gravity waves propagate along the surface of a fluid of depth h, moving in the plus x direction with uniform velocity V. Consequently the potential ϕ may be written in the form

$$\phi = Vx + \phi'\ (x,y,t)$$

where ϕ' is a perturbation on the potential of the uniform flow. For right-running waves it can be assumed that ϕ' has the form

$$\phi' = Ae^{i(kx-\omega t)}F(y)$$



Determine the form of F(y). Also formulate the surface conditions required to establish a dispersion relation. Find the dispersion relation.