Problem 1. p503, prob 2
Problem 2. p504, prob 50
Problem 3. p504, prob 51
Problem 4. Fluid Mechanics example. The equation for a ‘uni-directional’ fluid flow (i.e. in the $x$-direction) above a flat, solid boundary (at $z = 0$, say) is

$$\frac{\partial u}{\partial t} = \frac{\mu}{\rho} \frac{\partial^2 u}{\partial z^2},$$

where $\rho$ is the fluid density and $\mu$ is the fluid viscosity. For water, $\rho = 1\text{g/cm}^3$ and $\mu = 10^{-2}\text{g cm}^2/\text{s}$. Say there is so much fluid above the plate that you can ignore the top boundary. Say we drive the bottom boundary from side to side with a given stress (force per unit area) – this imposes a boundary condition on the fluid

$$\mu \frac{\partial u}{\partial z} \bigg|_{z=0} = A \cos \omega t.$$

Assuming you have been shaking the wall for a while (i.e. so that transients have died out), solve for the fluid flow. This is very similar to the problem we did in class. Look at your solution – how far do the shear waves (i.e. the fluid flow) propagate into the fluid? How does it depend upon frequency? What about the amplitude of motion – how does it depend upon frequency? Does this make sense to you intuitively?