

Homework #7
Introduction to physical oceanography

1. *Particle trajectories in gravity waves*: show that particle trajectories in an infinite-depth ocean ($kH \gg 1$) are circles, whose radius decays exponentially with depth.
2. More: (a) show that particle trajectories in gravity with a finite depth ocean (not very deep and not very shallow) are ellipses. (b) What are the two major axes of the ellipses? (c) How do the ellipse axes change with depth? (d) What do the trajectories look like near the bottom? You may want to use Kundu's book for some help with these problems on particle trajectories in gravity waves.
3. *Group velocity and phase velocity*: throw stones into some puddle (use the Charles if the weather finally gets better here). Follow the wave packets that radiate in circles from the stone. Each packet contains several wave crests. (a) Can you see how the crests move at a different speed than the packet? Which one moves faster, the crests or the packet? (b) what do you expect the answer to be given what we found in class regarding group and phase velocity (use the deep ocean approximation, how deep does the puddle need to be for this to be an appropriate approximation?) (c) Make a digital picture and attach to your answer. **(d) Challenge part:** make a small video (30 seconds or so) using a digital camera and email it to me. Best one will be posted on course home page.