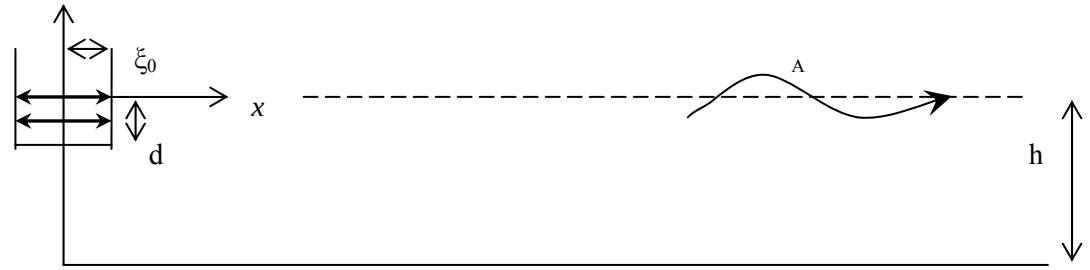
Homework 4

Course: 414.311A, Fall, 2007

Due Nov. 20

1. There is a piston-type wave-maker in a long tank of depth h. The piston is moving regularly with amplitude ξ_0 and frequency ω up to depth d. Derive wave amplitude A in far field.



2. Our SNU towing tank is the dimension of 110-m length and 3.5-m depth. Let's assume that we have a piston-type wave-maker up to depth 1m. If the piston is oscillating with 2-sec period, answer the following questions:

(1) Find the frequency of the first mode of local waves.

(2) At what *x*, does the first local wave component decay 50% from the wave maker (i.e. *x=0*)?

(3) Obtain wave amplitude in the region far from the wave maker.

3. Consider a ship moving with a constant speed U in 2D fluid domain. Regular waves are generated behind the ship. Assume potential flows around the body.

(1) Write the wave frequency and wave number as a function of speed U and gravitational constant g.

(2) Let's assume that the ship wave can be considered as a sum of the waves generated by a source at ship bow and a sink at ship stern with same strength. If a moving point singularity generates regular waves with amplitude written to $a\cos(kx)$ where *k* is wave number, find the distance of two singularities (i.e. ship length) which provides minimum wave height behind the ship.