

Homework number 8

Due Monday, October 17

References:

- Lighthill, *Waves in Fluids*, Cambridge University Press, 1978 (distributed in class).

16. In “deep water” (water depth greater than about 1/2 the wavelength), surface gravity waves obey the dispersion relation

$$\omega = \sqrt{gk}$$

where g is gravity, ω is the frequency, and k is the wavenumber. Show that for these waves, the wavelength is proportional to the square of the period. At what speed does a 10 m wave travel?

17. A former (after answering this question, you might understand why the word “former” appears) sea captain claims that during a stormy night in the North Atlantic he observed waves with wavelength of a few meters pass by his 50 m long boat in less than 3 seconds. Should you believe him?

17. Suppose you are in the middle of the ocean and observe a storm in the distance. Some time later you observe 5 m long waves passing by your boat. Two hours later you still see storm-generated gravity waves passing by your boat, but now their wavelength is only 2 m. How far away was the storm?