

Problems in marine hydrodynamics, Newman's book, Ch. 4.

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1. Calculate the (two-dimensional) added mass for a circle.
2. A floating vertical circular cylinder of radius  $R$  and draught  $h$  is neutrally buoyant. Assume that  $h \gg R$ . The cylinder is moving horizontally with an excursion  $x(t)$ . The cylinder is also moored with a spring force equal to  $-c_{11}x(t)$ .
  - a. Make a sketch of the cylinder.
  - b. Find the mass of the cylinder (hint: use the information in the text above).
  - c. Find the added mass of the cylinder (hint: use the information in the text above; apply a sectional estimate of the added mass).
  - d. Assume that only the spring force, inertia force and added mass force are acting on the oscillating cylinder, in the  $x$ -direction. Find the resonance frequency with and without the added mass.
3. Do problem 6 in Ch. 4, p. 155. Hint: in the first equation, for  $|z| > a$ , replace  $(a^2 - z^2)^{-1/2}$  by  $[(z + a)(z - a)e^{-i\pi}]^{-1/2}$
4. Do problem 1, Ch. 4, p. 154.