

## Problem 1D.1

### Uniform rotation of a fluid.

- (a) Verify that the velocity distribution in a fluid in a state of pure rotation (i.e., rotating as a rigid body) is  $\mathbf{v} = [\boldsymbol{\omega} \times \mathbf{r}]$ , where  $\mathbf{w}$  is the angular velocity (a constant) and  $\mathbf{r}$  is the position vector, with components  $x, y, z$ .
- (b) What are  $\nabla \mathbf{v} + (\nabla \mathbf{v})^\dagger$  and  $(\nabla \cdot \mathbf{v})$  for the flow field in (a)?
- (c) Interpret Eq. 1.2-7 in terms of the results in (b).