

Hydrodynamics  
Homework 6: Incompressibility  
22. November 2023

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**Problem:**

Prove the equality

$$\frac{d}{dt} \int_{\mathcal{V}(t)} \rho f \, dv = \int_{\mathcal{V}(t)} \rho \frac{df}{dt} \, dv,$$

where  $\rho$  is the density,  $f$  is a smooth function and  $\mathcal{V}(t)$  is a volume of the fluid at time  $t$ . You can use any formulas from the tutorial.