1. First Problem

Here, we begin the first problem. The incompressible Navier–Stokes equations are given by

$$\boldsymbol{\nabla} \cdot \boldsymbol{v} = 0 \qquad \text{and} \qquad \rho \dot{\boldsymbol{v}} = \mu \nabla^2 \boldsymbol{v} - \boldsymbol{\nabla} p \,, \tag{1}$$

where ρ is the fluid density, $\boldsymbol{v}$ is the fluid velocity, p is the pressure, μ is the fluid shear viscosity, and

$$\dot{\boldsymbol{v}} := \frac{\partial \boldsymbol{v}}{\partial t} + (\boldsymbol{\nabla} \boldsymbol{v}) \boldsymbol{v} \tag{2}$$

is the fluid acceleration.

(a). First sub-part

Here, we begin the first sub-part.