

2. Trajectory and streamline

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Problem 1.

Consider flow that is described in a lagrangian way using equations

$$x = Xe^{\alpha t}, \quad y = Ye^{-\alpha t}, \quad z = Z,$$

where X , Y and Z are the initial position of a fluid parcel and $\alpha > 0$.

- Find its trajectory.
- Find and plot its streamlines.
- Decide whether the flow is stationary.

Problem 2.

Consider the nonstationary flow

$$u = u_0, \quad v = kt, \quad w = 0,$$

where u_0 and k are positive constants. Derive how the streamlines look like and find the trajectories.