# Fundamentals of Fluid Mechanics B Questions and Answers

### Question by AME536A Student

*I am working on problem 3 from HW5, and I'm having a hard time starting the problem. The question asks to consider both Stoke's and Oseen's solution to find the velocity of a falling droplet, but in the tables, both of these are in polar coordinates only. Can we use this relationship:*

$$v = -\frac{\partial \Psi}{\partial x}$$

*like we did last semester after converting the* $\Psi$ *terms into x and y coordinates? As always, thanks for your time!*

In A5Q3, there is no reason to use the streamfunction. Rather use the derived drag force on a sphere outlined in the tables.

### Question by AME536A Student

*To clarify, we can use the drag force to find the velocity of the droplet for Stoke's and Oseen's solutions in part a of A5Q3? While trying to work this out using Newton's Law I find:*

$\Sigma F_y = ma$

$F_D = mg$

*and eventually*

$q_\infty = 1.5 * 10^{16} m/s$

*Which I don't believe is correct. Am I greatly oversimplifying the problem?*

Something is wrong. Make sure you write down your drag force correctly.

### Question by AME536A Student

*Hi Dr. Parent, I was hoping you could give me a hint for solving Q4 on Assignment #5. When solving it originally, I found an equation that looked like:*

$$\frac{\mu}{r}\frac{\partial}{\partial r}(r\frac{\partial v_\theta}{\partial r}) - \mu\frac{v_\theta}{r^2} = 0$$

*You indicated this problem was correct but I was unsure how to solve it from here. Are there any hints you can provide to help solve this differential equation? Thank you!*

Expand the first term on the LHS in two terms. Also, you can rewrite the second term on the LHS as

$$-\mu\frac{v_\theta}{r^2} = \mu\frac{\partial}{\partial r}\left(\frac{v_\theta}{r}\right) - \frac{\mu}{r}\frac{\partial v_\theta}{\partial r}$$

This will lead to various simplifications and an expression easy to integrate.

### Question by AME536B Student

*Would it be reasonable to ask for the LaTeX document used to produce the tables to be posted to the website?*

Download the latest version of the tables. At the bottom of the last page, there is a link that you can click to access the source files.

### Question by AME536A Student

*I have a question for Assignment 8 Q6 part b. This question tells us to find the error using the assumption we found in part a and the "freestream flow properties". I'm not sure I know what you mean by this. Are you referring to the $u_\infty$, $\rho$, $\mu$, etc. terms provided in the problem statement?*

For part (a), you need to outline a condition when this term is negligible. So, you need to compare its magnitude to the magnitude of another term in the same transport equation. In part (b), find the error simply as the ratio between this term and the other term to which it is compared to. Use order of magnitude analysis and substitute values for $u$, $\rho$, etc using the freestream properties.

### Question by AME536B Student

*Dr. Parent, would it be possible to review some of the following questions during the final lecture tomorrow?*

*HW2 Q1b*
*HW5 Q1c*
*HW8 Q6a*
*HW9 Q2*

*Thank you!*

Will look into it.