

Fundamentals of Fluid Mechanics B

Questions and Answers

Question by AME536B Student

Dr. Parent, for Question 3 part A, I'm not sure that the equation I am starting with is correct. Using force balance, and considering inertial terms to be 0, I would end up with

$$m \frac{dv}{dt} = F_D - F_g = 0$$

where,

F_D = Drag force

F_g = Force due to gravity

But no matter how I integrate this, I do not get a solution that would be similar to part C. I just wanted to confirm that I am starting the right way.

Yes this is correct. In part (a), the drag force should be equal to the gravitational pull force.

Question by AME536B Student

Dr. Parent, could you prove some hint as to which direction to think about for Question 2 in Assignment 6?

Both Blasius and Reynolds are exact solutions, but both differ by a lot from each other. The difference can not be due only to how they define the boundary layer height which I would expect to lead to a few percent error but not more. There is a fundamental difference in the problem that these 2 solutions are solving.. Look carefully through the assumptions and problem setup.

Question by AME536B Student

When describing wake theory, you utilize the following equation (see Assignment 8 question 1):

$$f(\eta) = \tanh(\eta)$$

What is the physical meaning of the variable η ? Searching through my notes from class, I could not find it ever being formally defined.

That's the non-dimensional version of the y coordinate. This was defined shortly after the guess for ψ early on in the far wake profile derivation.

Question by AME536B Student

When we approximate the velocity profile in a boundary layer with:

$$\frac{u}{u_{\infty}} = \frac{3}{2} \frac{y}{\delta} - \frac{1}{2} \left(\frac{y}{\delta} \right)^3$$

Are we assuming that u is the only component in the field, or is it necessary to approximate the v component as well from other means?

The answer to this question should be clear from the class notes. If we assumed a certain v distribution when deriving the u velocity profile, then you need to be consistent and keep the same v distribution. Otherwise, such u profile does not restrict how v can vary.

Question by AME536B Student

Dr. Parent, can we continue to submit revisions to the assignments until the Final exam?

Yes. It may take me 2-3 days to give you feedback.

Question by AME536B Student

Can you please omit problem 1 of homework 9? This problem asked for a proof whose intermediate steps were all clever mathematical manipulations rather than utilizing fluids concepts.

OK, this problem will be omitted.