Assignment 4

The first step in solving the assignment is given.

A laminar boundary layer has a velocity distribution given by \( u_1 = u e^{-y^*} \), find the displacement thickness.

\[ \delta = \frac{x}{u_1} \]

For the velocity distribution given in question 1, find the momentum thickness.

\[ \delta_\mu = \frac{u_1^2}{\mu} \]

In the case of flow over a flat plate, the ratio of the momentum thickness to the displacement thickness is given by

\[ \frac{\delta_\mu}{\delta} = \frac{1}{k} \]

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- Negative
- Zero
- Adverse
- All

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If a and b denote boundary layer thickness at a distance h from the leading edge when the Reynolds number are 100 and 255 respectively. Calculate \( \frac{\delta}{a} \).

\[ \frac{\delta}{a} = \frac{255}{100} \]

The velocity of a turbulent boundary layer varies as \( y^+ \). For this profile, the mean velocity varies as \( Re_{v_{id}}^{-\frac{1}{2}} \)

- \( Re_{v_{id}}^{-\frac{1}{2}} \)
- \( Re_{v_{id}}^{-\frac{1}{4}} \)
- \( Re_{v_{id}}^{-\frac{1}{3}} \)
- \( Re_{v_{id}}^{-\frac{1}{5}} \)

Boundary layer separation is associated with continuous loss of

- Energy
- Momentum
- Mass
- All of these

The velocity profile is given by \( y^+ = \frac{1}{2} \) and whether the flow has separated or not.

Separated
- Not separated
- Flow restarted
- All of these