Which of the following is NOT an example of Aerodynamics in action?

1. **Thrust of a rocket**
2. **Curve of a baseball**
3. **Drag of a car**
4. **Buoy floating down a river**
5. **Sailboat underway**
6. **Lift on an aircraft**

Or . . .

7. **All of the above involve Aerodynamics**

There is a thin boundary layer on a flat wall. The pressure and speed just above the boundary layer are p_∞ and V_∞. What is the pressure p at the wall?

1. $p = p_\infty + \frac{1}{2}\rho V_\infty^2$,
2. $p = p_\infty$
3. **There's no way to know for sure.**

An airfoil in an airstream has $C_p = 0.1$ at one particular surface point. When the freestream speed V_∞ is doubled, what is the new C_p at this point?

1. **New $C_p = 0.4$**
2. **New $C_p = 0.2$**
3. **New $C_p = 0.1$**
4. **New $C_p = 0.05$**
5. **New $C_p = 0.025$**

The frame of reference for observing a flowfield is changed. Which statement is true?

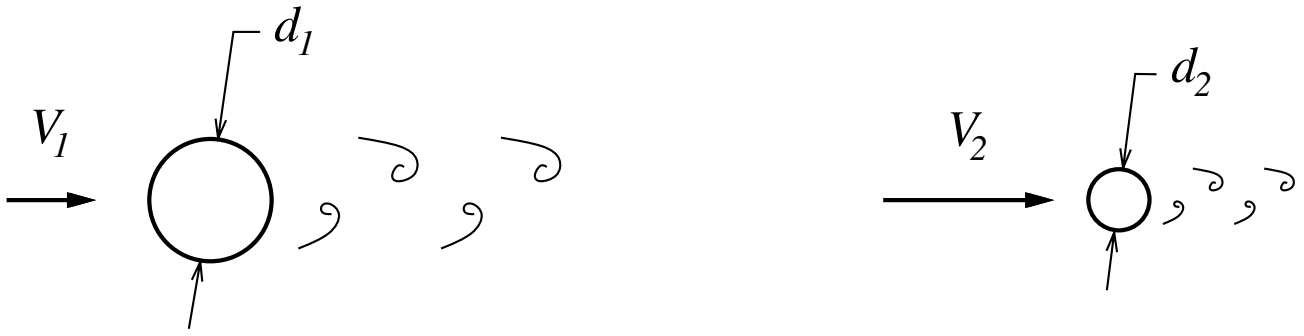
1. **Pressure field $\mathrm{p}(\mathrm{x}, \mathrm{y}, \mathrm{z}, \mathrm{t})$ stays the same**
2. **Velocity field $\vec{\mathrm{V}}(\mathrm{x}, \mathrm{y}, \mathrm{z}, \mathrm{t})$ stays the same**
3. **Speed field $\mathrm{V}(\mathrm{x}, \mathrm{y}, \mathrm{z}, \mathrm{t})$ stays the same**
4. **None of these fields will stay the same**
5. **All of these fields will stay the same**

An airfoil at a certain angle of attack has $M' = -10$, $L' = 0$. This is an example of ...

1. **This is a pure aerodynamic moment (couple)**
2. **An impossible situation**

Two low-speed flows about round cylinders have dynamic similarity, with $Re_1 = Re_2$, and shed vortices at frequencies f_1 and f_2 (Hz). What must be true?

1. $f_1 = f_2$
2. $f_1 d_1 = f_2 d_2$
3. $f_1 d_1 / V_1 = f_2 d_2 / V_2$
4. None of the above



The PS02 airfoil with 1m chord has:

$$\mathbf{Re} = 10^6 \qquad \mathbf{c_d} = 0.006$$

What is the diameter of a round cylinder with nearly the same drag/span D' in the same flow?

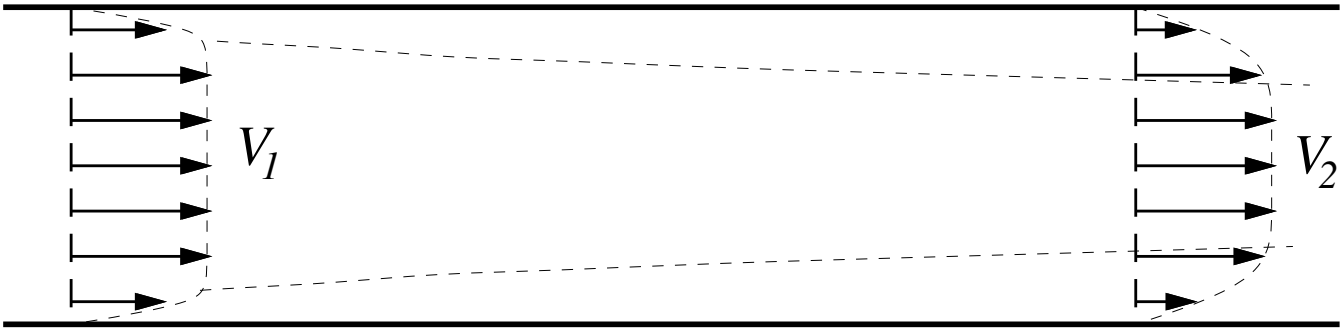
1. **1 mm**
2. **5 mm**
3. **20 mm**
4. **100 mm**
5. **None of the above**

The pace in UE Fluids so far is . . .

1. **Much too fast**
2. **Too fast but I'm managing**
3. **Just right**
4. **Somewhat too slow**
5. **Much too slow**

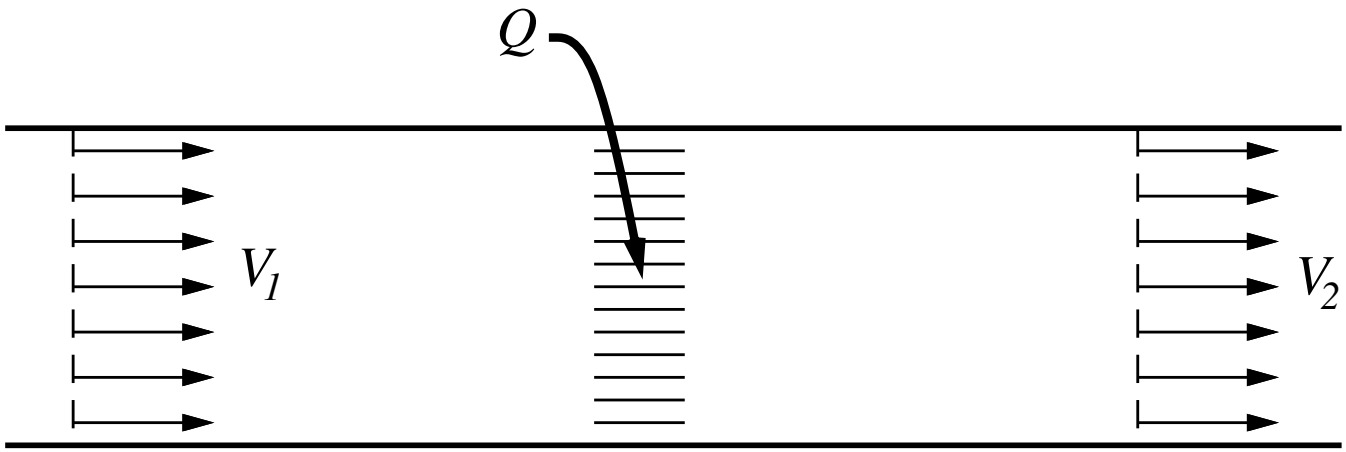
Boundary layers grow on the walls of the low-speed constant-area channel. How do the centerline velocities V_1 and V_2 compare?

1. $V_1 < V_2$
2. $V_1 = V_2$
3. $V_1 > V_2$
4. No way to tell for sure



A heater is placed in a slow-flowing channel. How do the two velocities V_1 and V_2 compare?

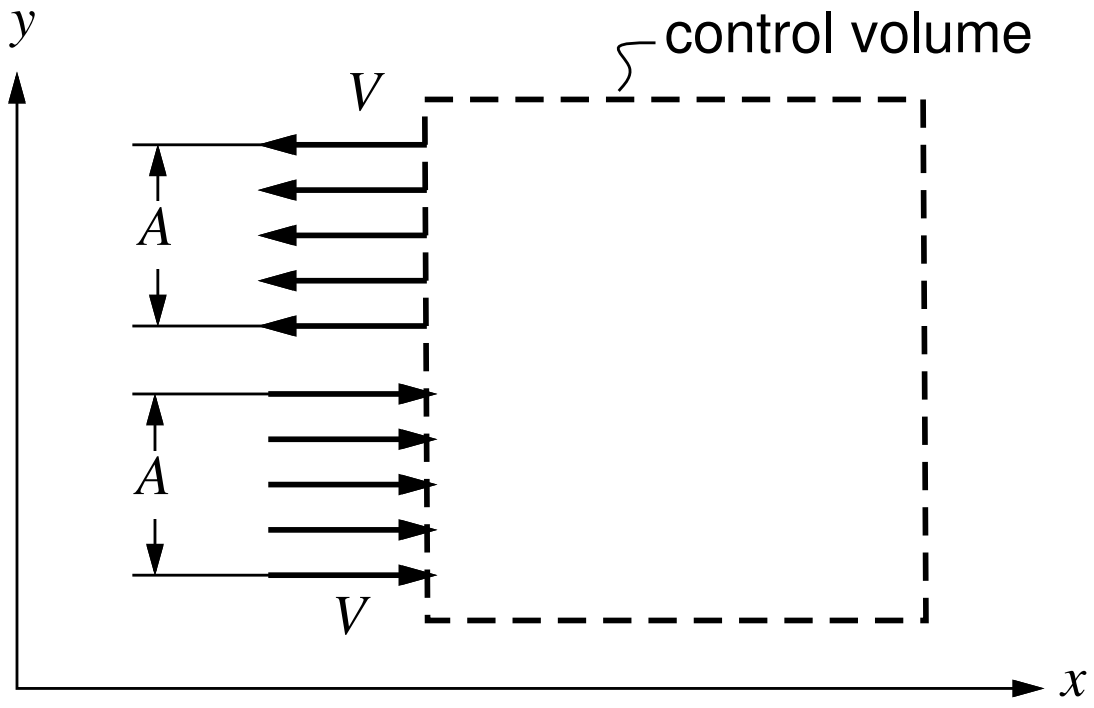
1. $V_1 < V_2$
2. $V_1 = V_2$
3. $V_1 > V_2$
4. No way to tell for sure



Two fluid jets of the same density ρ flow as shown. What is the mass flow integral for the control volume?

$$\rho\,\vec{\mathbf{V}}\cdot\hat{\mathbf{n}}\,\mathbf{dA}$$

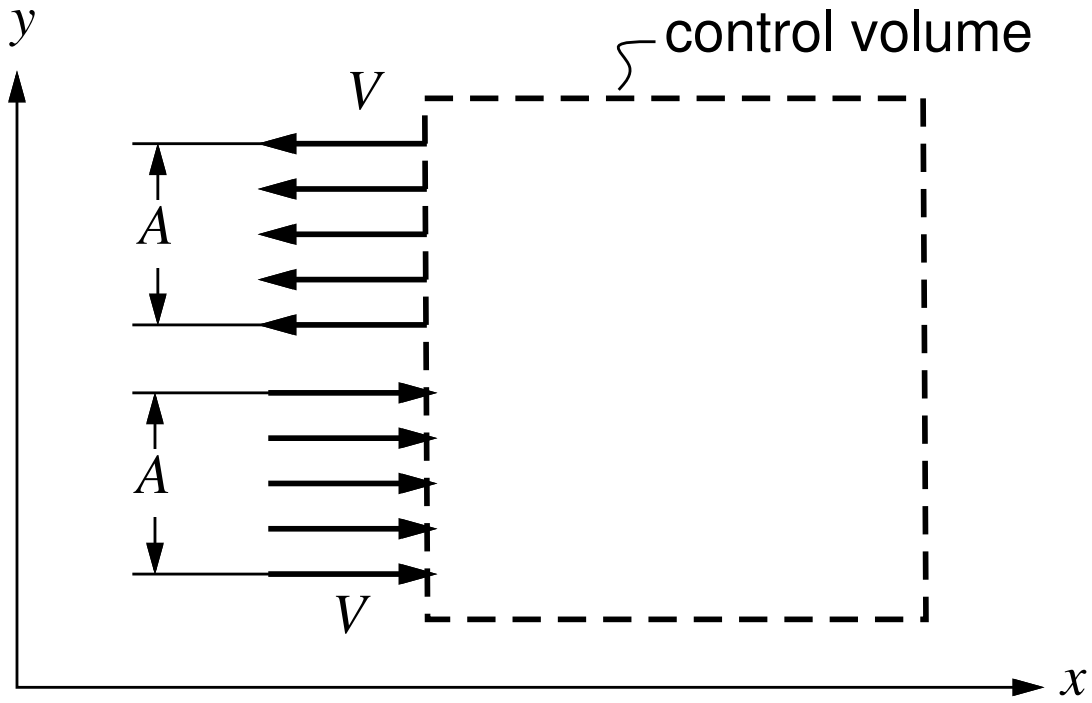
1. $\mathbf{2\rho VA}$
2. $\mathbf{2\rho VA}\,\hat{\imath}$
3. $\mathbf{\rho VA/2}$
4. $\mathbf{0}$



Two fluid jets of the same density ρ flow as shown. What is the momentum flow integral for the control volume?

$$\rho\left(\vec{\mathbf{V}}\cdot\hat{\mathbf{n}}\right)\,\vec{\mathbf{V}}\,\mathbf{dA}$$

1. $\rho\mathbf{V^2A}\,\hat{\imath}$
2. $\mathbf{2}\rho\mathbf{V^2A}\,\hat{\imath}$
3. $-\mathbf{2}\rho\mathbf{V^2A}\,\hat{\imath}$
4. $\mathbf{0}$



The force on the body $\vec{R}$ is computed in two ways:

a) Using the true pressure p

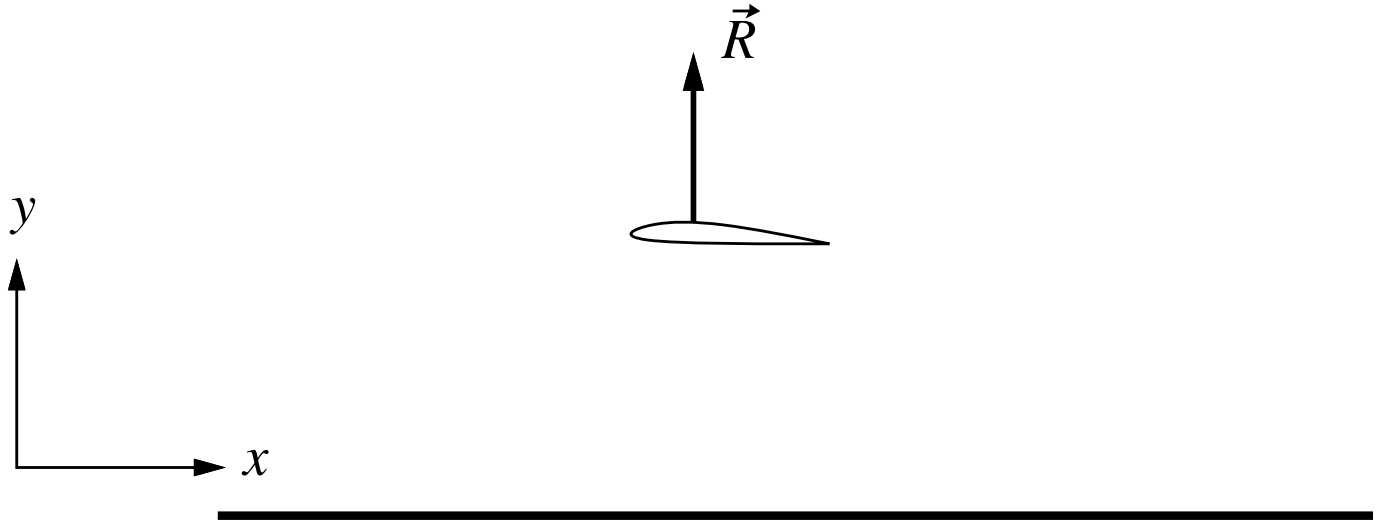
b) Using the corrected pressure p_c

What can you say about the difference $\vec{R}_p - \vec{R}_{p_c}$?

1. **It's zero.**
2. **Depends only on the body volume.**
3. **Depends on the body shape in a complicated way.**

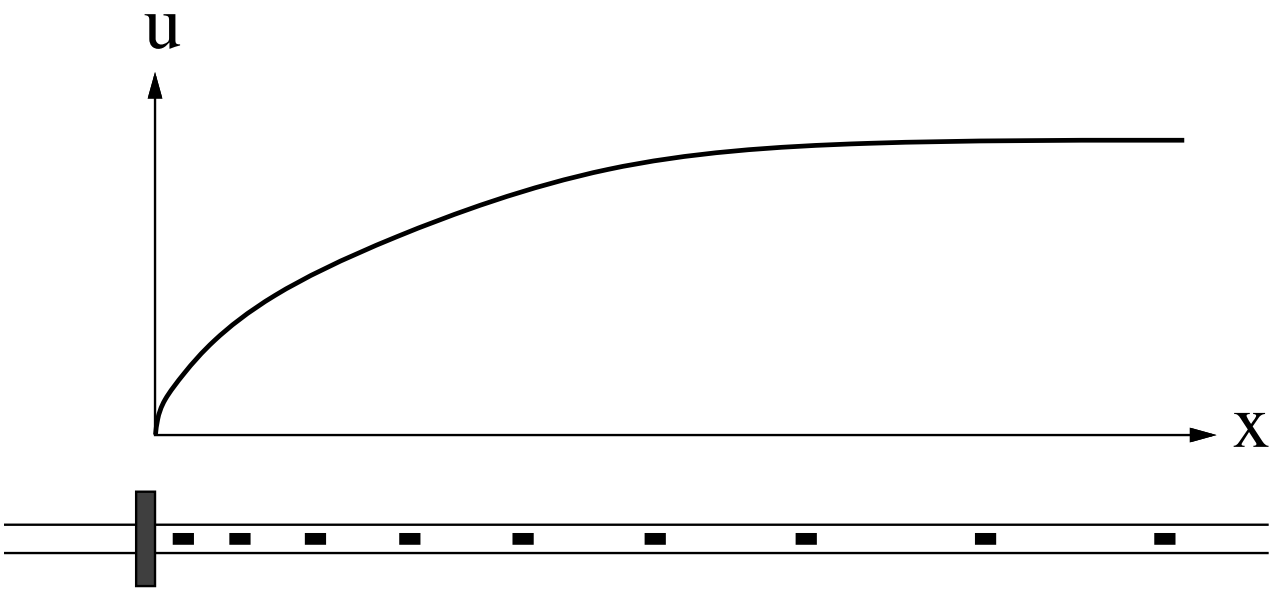
A wing with lift force $\vec{\mathbf{R}} = \mathbf{L}\hat{\jmath}$ flies overhead. What is the resulting force applied to the ground?

1. **0**
2. **$\mathbf{L}\hat{\jmath}$**
3. **$-\mathbf{L}\hat{\jmath}$**



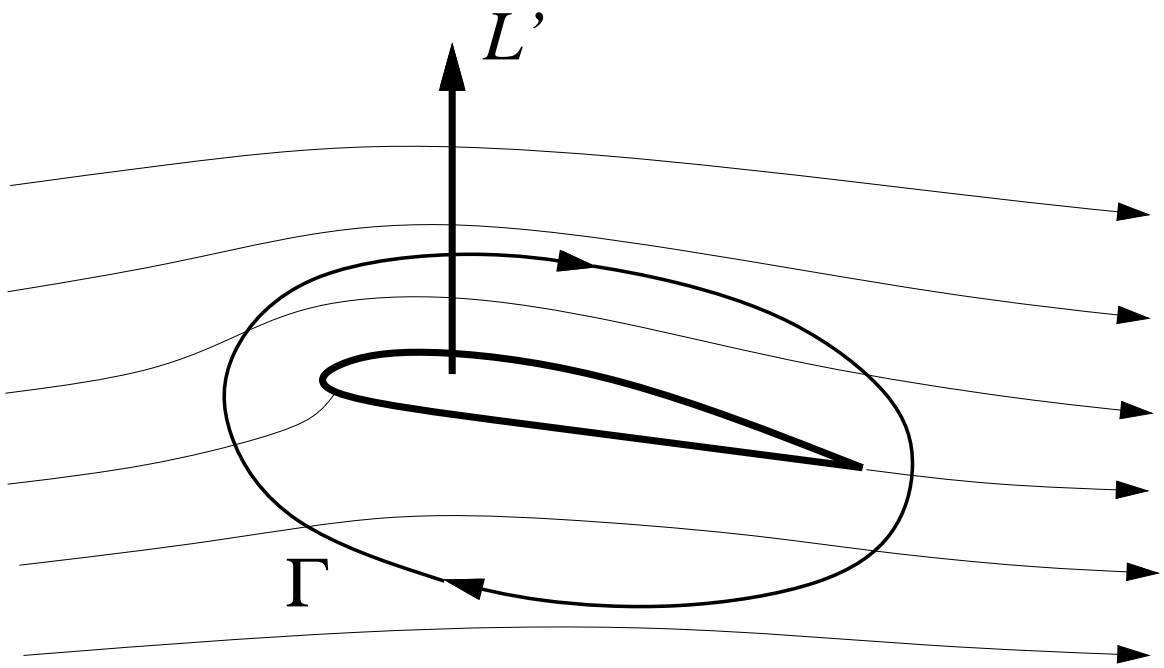
Traffic leaves a toll gate located at x = 0. At some location x, every car's speed is u(x). What is a car's acceleration at location x ?

1. u^2/x
2. du/dt
3. u du/dx
4. Cannot be determined from the given information



What must be true about the circulation Γ around a lifting airfoil as shown?

1. $\Gamma < 0$
2. $\Gamma = 0$
3. $\Gamma > 0$
4. No way to know for sure from given information



An airfoil generates lift in irrotational flow. How do the two circulations Γ_1 and Γ_2 compare?

1. $\Gamma_1 < \Gamma_2$
2. $\Gamma_1 = \Gamma_2$
3. $\Gamma_1 > \Gamma_2$
4. No way to know for sure from given information