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 \( p_\infty \) and \( V_\infty \). What is the pressure \( p \) at the wall?

1. \( p = p_\infty + \frac{1}{2} \rho V^2 \)
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 $V_\infty$ 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 \( p(x, y, z, t) \) stays the same
2. Velocity field \( \vec{V}(x, y, z, t) \) stays the same
3. Speed field \( V(x, y, z, t) \) 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 $\text{Re}_1 = \text{Re}_2$, 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:

\[ \text{Re} = 10^6 \quad c_d = 0.006 \]

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 $\rho$ flow as shown. What is the mass flow integral for the control volume?

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

1. $2\rho VA$
2. $2\rho VA \hat{i}$
3. $\rho VA/2$
4. 0
Two fluid jets of the same density $\rho$ flow as shown. What is the momentum flow integral for the control volume?

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

1. $\rho V^2 A \hat{i}$
2. $2\rho V^2 A \hat{i}$
3. $-2\rho V^2 A \hat{i}$
4. 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 $\vec{R}_p - \vec{R}_{pc}$?

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 $\vec{R} = L\hat{j}$ flies overhead. What is the resulting force applied to the ground?

1. 0
2. $L\hat{j}$
3. $-L\hat{j}$
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 $\Gamma$ 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 $\Gamma_1$ and $\Gamma_2$ 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