**Lecture F5 Mud: Reynolds and Mach Numbers**
(38 respondents)

1. **What are $u$ and $n$, and how do they affect the shear force?** (3 students)
The surface shear stress $\tau$ is the tangential component of the force/area $\vec{f}$ that the fluid applies to the surface (the pressure $p$ is the other normal component). See lecture F3. The shear stress is the result of the fluid in the boundary layer being *sheared*, or continuously deformed. The deformation rate is equal to the tangential-velocity gradient normal to the surface $= \partial u/\partial n = \dot{\gamma}$. The viscosity is the ratio of proportionality between the shear stress $\tau$ and the deformation rate: $\tau = \mu \, \partial u/\partial n$.

2. **Why does $p - p_\infty$ have no effect on the net force?** (1 student)
You mistunderstood. It does have an effect. The unform pressure $p_\infty$ alone has no effect. You can see this from the buoyancy force formula.
$$F_y \;=\; -\upsilon \, dp_\infty/dy \;=\; 0$$
since $p_\infty$ is a constant.

3. **In $M$ formula, what is $a_\infty$?** (1 student)
The speed of sound in the freestream.

4. **Why does $q_\infty = \frac{1}{2}\rho_\infty V_\infty^2$?** (1 student)
This is simply the definition of $q_\infty$ (i.e. $q$ is just shorthand for $\frac{1}{2}\rho V^2$, nothing more).

5. **What is $c_m$?** (1 student)
It's the nondimensionalized form of the moment/span $M'$.

6. **What does $\Delta p/p_\infty$ describe?** (1 student)
The fractional changes of local pressure from the ambient pressure. See the last figure in F5 notes.

7. **Why does the curve in the $p/p_\infty$ plot look like it does?** (2 students)
The pressure is plotted along the drawn streamline. The pressure is always high near the leading edge stagnation point, and also somewhat high near the trailing edge. The pressure is lowest just above the top of a lifting airfoils.

8. **Why does $c_d \downarrow$ when $Re \uparrow$?** (1 student)
Note that $Re \sim 1/\mu$. So a larger $Re$ implies a smaller $\mu$, which in turn implies smaller shear stress and less drag.

9. **Pace is fast, and it's tough to get an intuitive feel for fluids.** (3 students)
Yes, fluid dynamics is challenging, partly because its not just a simple extension of particle dynamics. See me or the TA's if you need help catching up.

10. **No mud** (24 students)