

AE236: Compressible Fluid Mechanics
Tutorial 2

1. Answer either true or false with a brief explanation: For a given gas at a given state, analytical solution to pressure ratio, density ratio, temperature ratio and downstream Mach number can be written in terms of the upstream Mach number only if we assume an ideal, calorically perfect gas.
2. Consider two flows, one of helium and one of air, at the same Mach number of 5. Which gas will result in the stronger shock? Explain with numbers.
3. A normal shock is moving with a speed 550 m/s into still air at 1bar and 16⁰C.
(a)Compute the pressure, temperature and velocity downstream of the shock wave.
(b)Compute the stagnation pressure and temperature downstream of the shock. Are they larger/smaller/equal to the stagnation pressure and temperature upstream of the shock?
(c) Explain and resolve any inconsistencies that you find in (b) from your understanding of the change of stagnation properties across a normal shock.