F14. An aircraft is flying at speed V_∞, in an atmosphere with p_∞, and ρ_∞.

a) What is the flight Mach number M_∞? Give in terms of the quantities above.

b) Determine the stagnation pressure p_o at the nose of the aicraft in two ways:

i) The exact full compressible equation.

ii) The incompressible Bernoulli equation, pretending $\rho = \rho_\infty$ is constant.

Plot p_o/p_∞ versus M_∞ for the two equations. Also plot the "Bernoulli error"

$$(p_o/p_\infty)_{\text{exact}} - (p_o/p_\infty)_{\text{Bernoulli}}$$

versus M_∞. What would you judge to be a reasonable upper Mach limit on the validity of the Bernoulli equation?