F14. An aircraft is flying at speed $V_\infty$, in an atmosphere with $p_\infty$, and $\rho_\infty$.

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

b) Determine the stagnation pressure $p_o$ at the nose of the aircraft in two ways:
   i) The exact full compressible equation.
   ii) The incompressible Bernoulli equation, pretending $\rho = \rho_\infty$ is constant.

Plot $p_o/p_\infty$ versus $M_\infty$ for the two equations. Also plot the “Bernoulli error”

\[
\frac{(p_o/p_\infty)_{\text{exact}}}{p_o/p_\infty}_{\text{Bernoulli}}
\]

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