Problem 332A

For the purposes of an experiment we wish to design a convergent/divergent nozzle (a de Laval nozzle) which will be supplied from a compressed air reservoir ($\gamma = 1.4$). It is required that:

1. there is a normal shock across the exit of the diffuser
2. that the jet emerging downstream of the shock should have a Mach number of 0.5.

Find:

(a) the ratio of the cross-sectional area at the diffuser exit to the cross-sectional area of the throat.

(b) the ratio of the pressure downstream of the shock to the throat pressure.

(c) the ratio of the pressure downstream of the shock to the pressure in the compressed air reservoir.