1. We have seen that if we define the quantity η (specific entropy) as a solution to the partial differential equations

$$
\begin{aligned}
\frac{\partial e}{\partial \eta}(\eta, \rho) &= \theta, \\
\rho^2 \frac{\partial e}{\partial \rho}(\eta, \rho) &= p,
\end{aligned}
$$

then we get a quantity whose volume integral increases in time.

Find the explicit formula for specific entropy, that is find

$$\eta = \eta(\theta, \rho),$$

provided that we work with the so-called *calorically perfect ideal gas*. This means that the pressure p is related to the temperature and the density via

$$p(\theta, \rho) = c_{\mathrm{V}} (\gamma - 1) \rho\theta,$$

where γ is a constant referred to as the *adiabatic index* and c_{V} is a constant referred to as the *specific heat at constant volume*, and that the internal energy e is related to the temperature via

$$e(\theta, \rho) = c_{\mathrm{V}}\theta.$$