Problem 1. (20 points) 6.3

Problem 2. (20 points) Starting from $S = S(T,V)$, prove the following
relationship for liquids:

$$\left(\frac{\partial S}{\partial T}\right)_P = \frac{C_V}{T} + \frac{V\beta^2}{\kappa}$$

where C_V, β and κ are the heat capacity at constant volume, the volume expansivity and the
isothermal compressibility, respectively. The following triple product rule will be useful
during the derivation:

$$\left(\frac{\partial X}{\partial Y}\right)_Z \left(\frac{\partial Z}{\partial X}\right)_Y \left(\frac{\partial Y}{\partial Z}\right)_X = -1.$$