

Consider the gas in the reservoir of the supersonic wind tunnel discussed in Examples 7.2 and 7.3. The pressure and temperature of the air in the reservoir are 20 atm and 300 K respectively. The air in the reservoir expands through the wind tunnel duct. At a certain location in the duct, the pressure is 1 atm. Calculate the air temperature at this location if: (a) the expansion is isentropic and (b) the expansion is nonisentropic with an entropy increase through the duct to this location of $320 \text{ J}/(\text{kg} \cdot \text{K})$.

$$(a) \quad p_1 = 20 \text{ atm} \quad , \quad T_1 = 300 \text{ K} \quad , \quad p_2 = 1 \text{ atm}$$

$$(b) \quad \Delta s = 320 \frac{\text{J}}{\text{kg} \cdot \text{K}}$$