1.37 A rigid tank contains air at a pressure of 90 psia and a temperature of 60 °F. By how much will the pressure increase as the temperature is increased to 110 °F?

\[ p = \rho RT \quad \text{(Eq. 1.8)} \]

For a rigid closed tank the air mass and volume are constant so \( \rho \) = constant. Thus, from Eq. 1.8 (with \( R \) constant)

\[ \frac{p_1}{T_1} = \frac{p_2}{T_2} \quad \text{(1)} \]

where \( p_1 = 90 \text{ psia} \), \( T_1 = 60^\circ \text{F} + 460 = 520^\circ \text{R} \), and \( T_2 = 110^\circ \text{F} + 460 = 570^\circ \text{R} \). From Eq. (1)

\[ p_2 = \frac{T_2}{T_1} p_1 = \left( \frac{570^\circ \text{R}}{520^\circ \text{R}} \right) (90 \text{ psia}) = 98.7 \text{ psia} \]