1.50

1.50 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?

$p = \rho R T$ (Eq. 1.8)

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

$$\frac{p_1}{T_1} = \frac{p_2}{T_2} \qquad (1)$$

where $p_1 = 90$ psia, $T_1 = 60°F + 460 = 520°R$, and $T_2 = 110°F + 460 = 570°R$. From Eq. (1)

$$p_2 = \frac{T_2}{T_1} p_1 = \left(\frac{570°R}{520°R}\right)(90 \text{ psia}) = \underline{\underline{98.7 \text{ psia}}}$$