Home Work #1

Problems 1-9, 1-10, 2-8, 2-12, 2-13 from the book and

#1

Consider a gas which obeys the Dieterici equation of state

\[ p = \frac{nRT}{V - nb} \exp\left( - \frac{na}{RTV} \right), \]

where \( p \) is pressure, \( V \) is volume, \( T \) is the absolute temperature, \( n \) is the number of moles, \( R \) is the gas constant, and \( a \) and \( b \) are material constants. Show that the pressure, volume, and temperature at the critical point are

\[ p_c = \frac{a}{4e^2b^2}, \quad V_c = 2nb, \quad T_c = \frac{a}{4Rb}, \]

and rewrite this equation of state in a form which shows the law of corresponding states.