5) A scientist proposed the following equation of state:

$$p = \frac{RT}{V_m} - \frac{B}{V_m^2} + \frac{C}{V_m^3} \, ,$$

where B and C are independent of the temperature. Show that the equation leads to critical behavior. Find the critical constants of the gas in terms of B and C and an expression for the critical compression factor. [$V_c = 3C/B$; $T_c = B^2/3RC$; $p_c = B^3/27C^2$; $Z_c = 1/3$].