Root Finding: Redlich-Kwong Equation

The Redlich-Kwong equation of state is given by:

$$p = \frac{RT}{v-b} - \frac{a}{v(v+b)\sqrt{T}}$$

where R = gas constant, T = absolute temperature (K), p = absolute pressure (kPa), and v = specific volume (m^3/kg). The parameters a and b are calculated by:

$$a = 0.427\frac{R^2 T_c^{2.5}}{p_c} \quad , \quad b = 0.0866R\frac{T_c}{p_c}$$

For methane, R = 0.518 kJ/(kg-K), and the critical pressure and temperature are p_c = 4580 kPa, and T_c = 191 K respectively. As a chemical engineer, you are asked to determine the amount of methane fuel that can be held in a V=3 m^3 tank at a temperature of 223 degrees K with a pressure of 65,000 kPa.

a) Estimate v using the graphical method.
b) Estimate v using `fzero()`.
c) Compare the specific volume using the Redlich-Kwong equation of state to the ideal gas law $Pv=RT$. Are the results similar?