16.33. **Model:** Assume that the gas is an ideal gas.
Visualize: Please refer to Figure Ex16.33.
Solve: **(a)** The graph shows that the pressure is inversely proportional to the volume. The process is isothermal.
(b) From the ideal-gas law,

$$T_1 = \frac{p_1 V_1}{nR} = \frac{\left(3 \times 1.013 \times 10^5 \text{ Pa}\right)\left(100 \times 10^{-6} \text{ m}^3\right)}{\left(0.0040 \text{ mol}\right)\left(8.31 \text{ J/mol K}\right)} = 914 \text{ K}$$

T_2 is also 914 K, because the process is isothermal.
(c) The before-and-after relationship of an ideal gas under isothermal conditions is

$$p_1 V_1 = p_2 V_2 \Rightarrow V_2 = V_1 \frac{p_1}{p_2} = \left(100 \text{ cm}^3\right)\left(\frac{3 \text{ atm}}{1 \text{ atm}}\right) = 300 \text{ cm}^3$$