

Graza Qmark

$$\begin{aligned} 7.2: \quad P &= -\frac{dU}{dV} = -\frac{d}{dV} (N \bar{E}) \\ &= -\frac{d}{dV} \left( \frac{3}{5} N E_F \right) \\ &= -\left( \frac{3}{5} N \right) \frac{dE_F}{dV} \end{aligned}$$

$$\text{We know, } E_F = \frac{\hbar^2}{2m} \left( \frac{3\pi^2 N}{V} \right)^{2/3} = C V^{-2/3}.$$

$$\begin{aligned} \frac{dE_F}{dV} &= C \left( -\frac{2}{3} \right) V^{-5/3} = \left( -\frac{2}{3} \right) V^{-1} C V^{-2/3} \\ &= \left( -\frac{2}{3} \right) V^{-1} E_F \end{aligned}$$

$$\begin{aligned} \Rightarrow P &= -\left( \frac{3}{5} N \right) \left( -\frac{2}{3} \right) \frac{1}{V} E_F \\ &= \boxed{\frac{2}{5} \frac{N}{V} E_F} \end{aligned}$$