(c) $\begin{cases} P(x) = P_0 + \frac{k}{A}x \cdots ① \\ V(x) = V_0 + Ax \cdots ② \end{cases}$ thus, $\Rightarrow x = \frac{V - V_0}{A}$

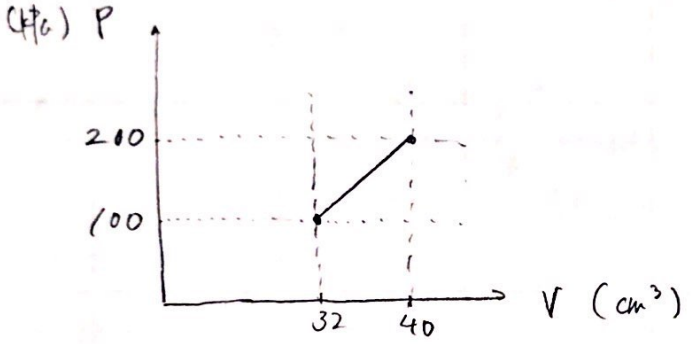
plug into ①

$$P = P_0 + \frac{k}{A}\frac{V - V_0}{A} = P_0 + \frac{k}{A^2}(V - V_0)$$

$$P = \frac{k}{A^2}V + P_0 - \frac{kV_0}{A^2}$$

$$P = \left(\frac{20N}{cm}\right)\left(\frac{1}{4.0^2\ cm^4}\right)V + 100kPa - \left(\frac{20N}{cm}\right)(32\ cm^3)\left(\frac{1}{4.0^2\ cm^4}\right)$$

$$P = 12.5\,V - 300 \quad : \quad P(kPa),\ V(cm^3)$$



(d) $kPa \rightarrow Pa$ & $cm^3 \rightarrow m^3$

$$P = 1.25 \times 10^{10} V - 300000$$

$$W = \int_{V_0}^{V_1} P(V)\,dV$$

$$= \int_{32\times10^{-6}}^{40\times10^{-6}} (1.25\times10^{10}V - 3\times10^5)\,dV$$

$$= \left[0.625\times10^{10}V^2 - 3\times10^5\,V\right]_{32\times10^{-6}}^{40\times10^{-6}}$$

$$= 3.6 - 2.4 = \boxed{1.2\ J}$$