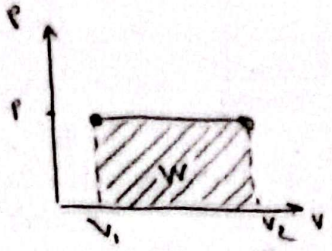
* Work according to the process Constant:

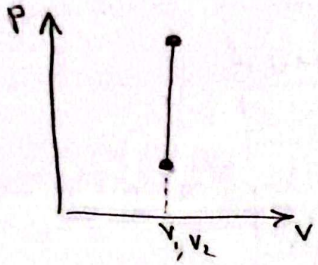
1) isobaric process (P Const.)

$$W = \int_1^2 P \cdot dV = P(V_2 - V_1)$$



2) isochoric process (V Const.) [rigid tank]

$$W = \int_1^2 P \cdot \cancel{dV}^{\,0} \rightarrow W = 0$$

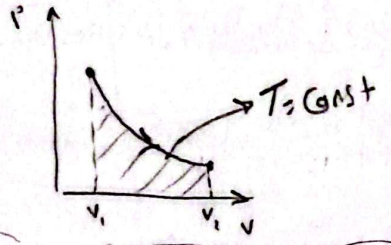


3) isothermal process (T Const.)

$$PV = C$$

$$\therefore W = \int_1^2 P \cdot dV = \int_1^2 \frac{C}{V} \cdot dV \rightarrow W = C \ln V \Big|_1^2 \rightarrow W = C \ln \frac{V_2}{V_1}$$

$$\rightarrow W = P_1 V_1 \ln \frac{V_2}{V_1}$$



4) Polytropic process ($PV^n = \text{Const} = C$)

$$W_{1-2} = \int_1^2 P \cdot dV = \int_1^2 \frac{C}{V^n} \cdot dV = C\left(\frac{V^{1-n}}{1-n}\Big|_1^2\right) = \frac{C}{1-n}\left[V_2^{1-n} - V_1^{1-n}\right]$$

$$= \frac{1}{1-n}\left[P_2 V_2^n \cdot V_2^{1-n} - P_1 V_1^n V_1^{1-n}\right] = \frac{1}{1-n}\left[P_2 V_2 - P_1 V_1\right]$$

$$= \frac{mR}{1-n}\left[T_2 - T_1\right] \rightarrow n \neq 1$$