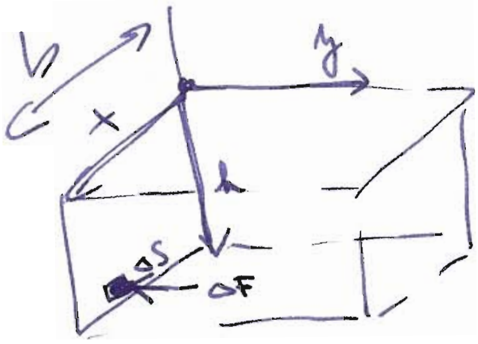
8. 12. 2008

DOBRÝ DEN!



! TLAK NA PŘEHRADNÍ HRÁZ !

$\downarrow h$

$p = p_0 + h\rho g$

$p = \frac{\Delta F}{\Delta S}$

$\Delta F = p\,\Delta S$

$\int dF = \iint p\,dS$

$F_V = \iint p\,dS$

$dS = dx\,dh \qquad p(h)$

$F_V = \int_0^H \int_0^b (p_0 + h\rho g)\,dx\,dh$ ($p_0 \to 0$) $= b \int_0^H h\rho g\,dh$

$= b\rho g \left[\frac{h^2}{2}\right]_0^H =$

$F_V = \frac{1}{2}\rho b g H^2$

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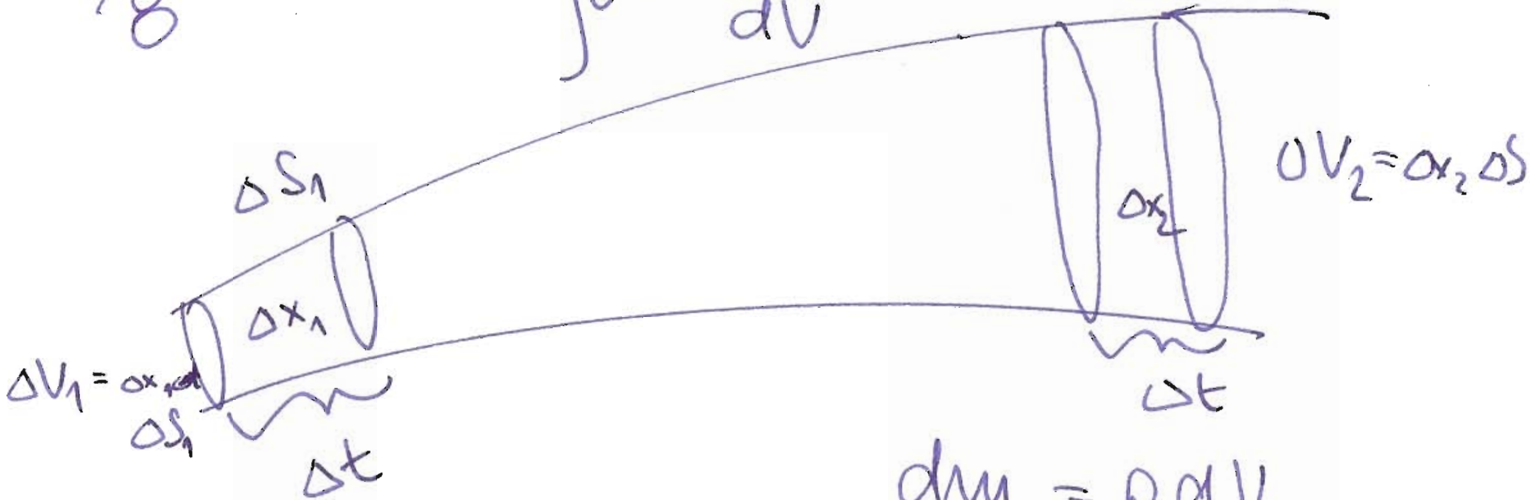
zákon zachování hmotnosti

„ve vodě"

„(ne vodě)"

$$\rho = \frac{dm}{dV}$$



$$dm = \rho\, dV$$
$$dm_1 = \rho\, dV_1$$
$$dm_2 = \rho\, dV_2$$

$$\frac{dm_1}{dt} = \frac{dm_2}{dt}$$

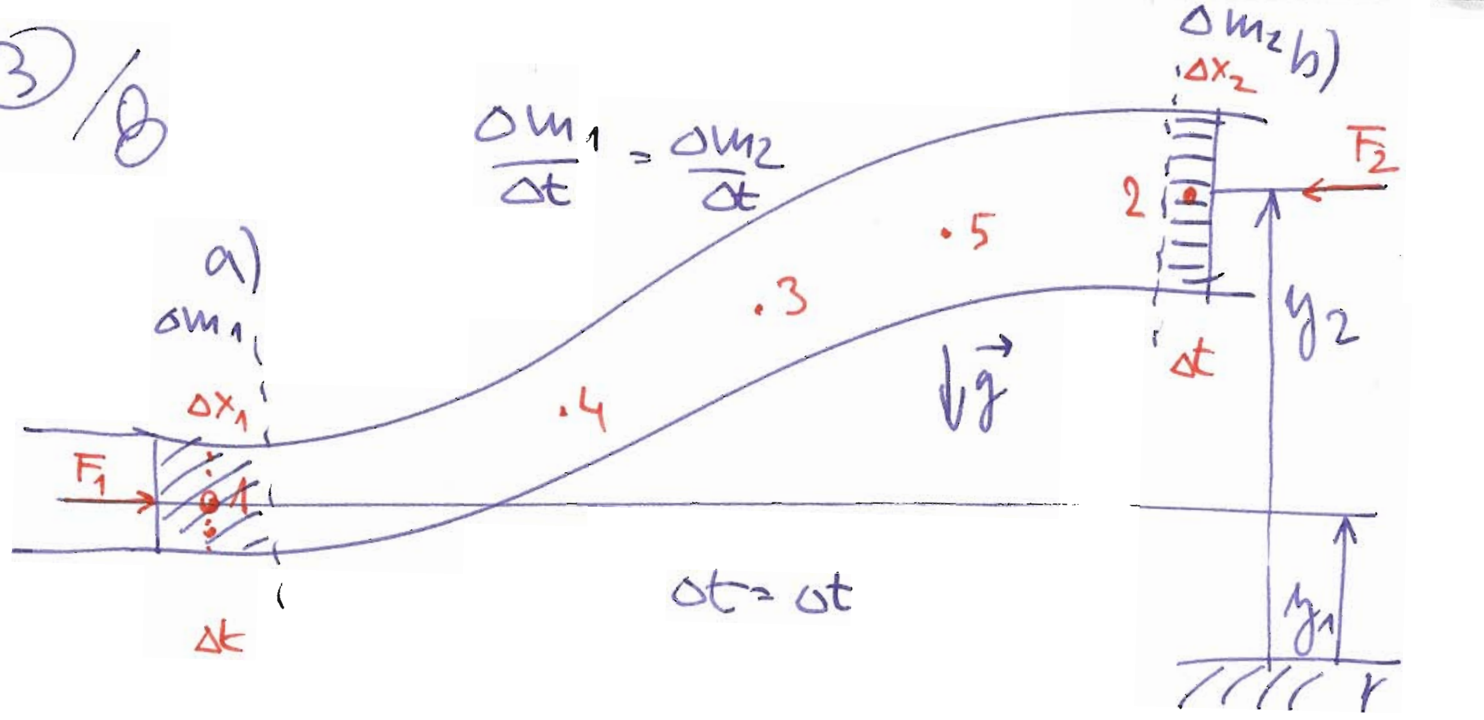
$$\frac{\rho\, dV_1}{dt} = \frac{\rho\, dV_2}{dt} \qquad \rho = \text{konst.}$$

$$\frac{d(S_1 x_1)}{dt} = \frac{d(S_2 x_2)}{dt}$$

$$\boxed{S_1 v_1 = S_2 v_2}$$

rovnice kontinuity (ρ = konst)

Bernoulli: **ZZME** ve vodě



S(ily:

$\vec{F}_1, \vec{F}_2, \vec{G}$

$$W_{\vec{F}_{V},a)\to b)} = \Delta E_k = E_{k,b)} - E_{k,a)}$$

$$= \frac{1}{2}\Delta m\, v_2^2 - \frac{1}{2}\Delta m\, v_1^2$$

$$\boxed{p = \frac{F}{S}}$$

$$= -\Delta E_{p,t} = E_{p,t}(\mathrm{I}) - E_{p,t}(\mathrm{II})$$

$$F_1 \Delta x_1 + (-F_2)\Delta x_2 + W_{\vec{G},1\to 2} = \Delta E_k$$

$$F_1 \Delta x_1 - F_2 \Delta x_2 + \Delta m g y_1 - \Delta m g y_2 = \frac{1}{2}\Delta m v_2^2 - \frac{1}{2}\Delta m v_1^2$$

$$p_1 \underbrace{S_1 \Delta x_1}_{\Delta V_1} - p_2 \underbrace{S_2 \Delta x_2}_{\Delta V_2} + \Delta m g y_1 - \Delta m g y_2 = \frac{1}{2}\Delta m v_2^2 - \frac{1}{2}\Delta m v_1^2$$

$$\Delta V_1 = \Delta V_2$$

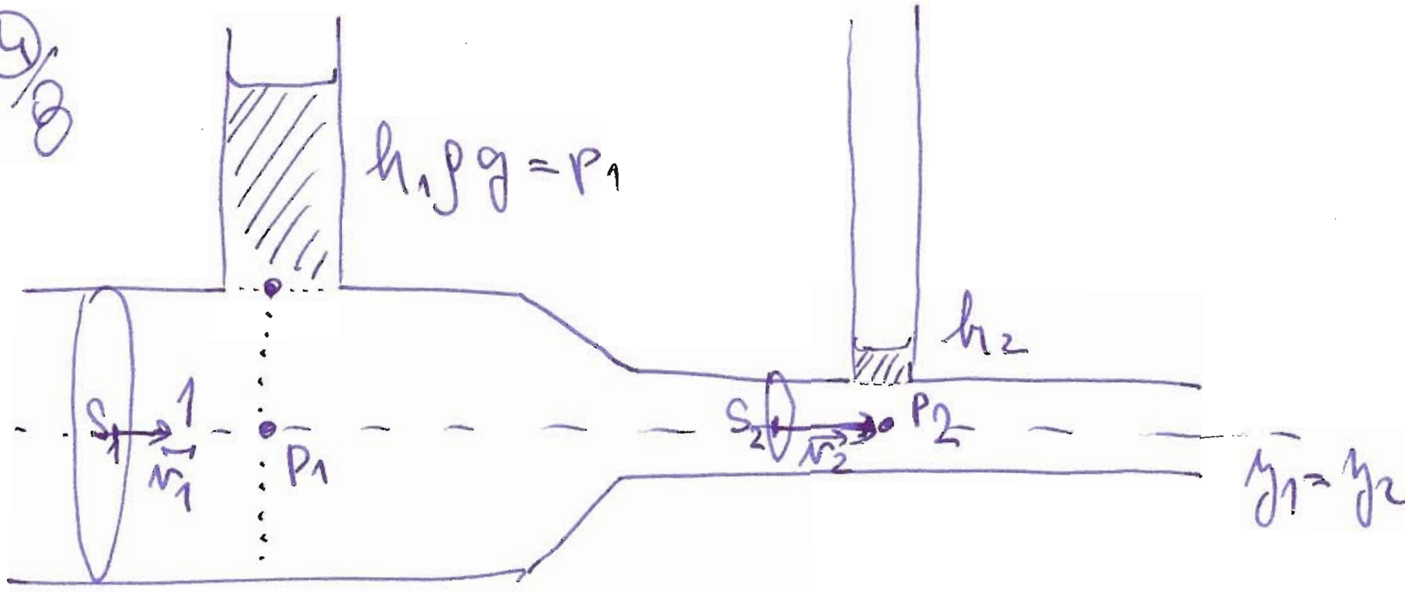
B.r.: $\boxed{p + \frac{1}{2}\rho v^2 + \rho g y = konst}$

$$\rho = \frac{\Delta m}{\Delta V}$$

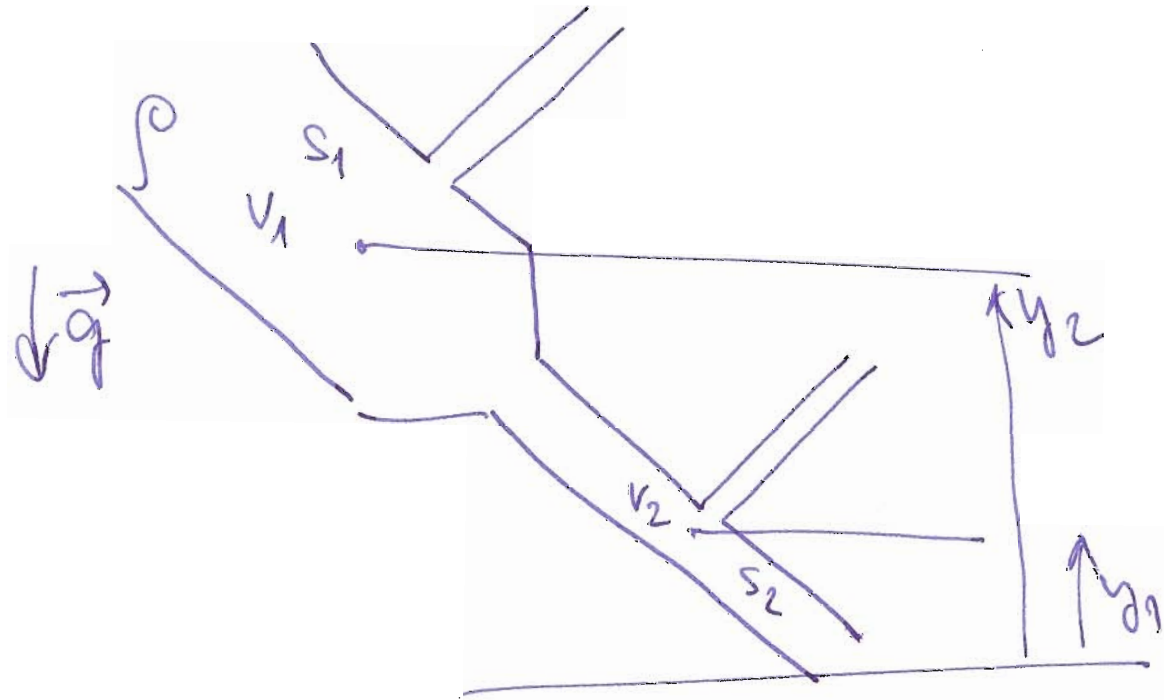
$$p_1 \Delta V - p_2 \Delta V + \Delta m g y_1 - \Delta m g y_2 = \frac{1}{2}\Delta m v_2^2 - \frac{1}{2}\Delta m v_1^2 \quad / :\Delta V$$

$$p_1 - p_2 + \rho g y_1 - \rho g y_2 = \frac{1}{2}\rho v_2^2 - \frac{1}{2}\rho v_1^2$$

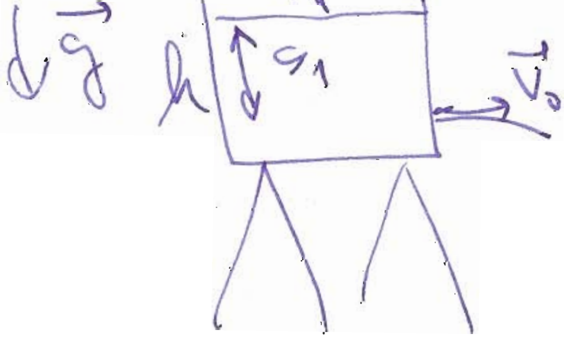
$$p_1 + \frac{1}{2}\rho v_1^2 + \rho g y_1 = p_2 + \frac{1}{2}\rho v_2^2 + \rho g y_2 = \ldots$$



$$p_1 + \frac{1}{2}\rho v_1^2 = p_2 + \frac{1}{2}\rho v_2^2$$



Př.: Její aplikace na Divadelní zahradě MRW



TERMODYNAMIKA

I. VT: ZZE

$$U_F - U_i = W_{ext} + Q$$

>0 ← $U_F - U_i$

W_{ext}: práce vnějších sil >0

Q: teplo dodané >0

W_{int} ↙↗ práce plynu

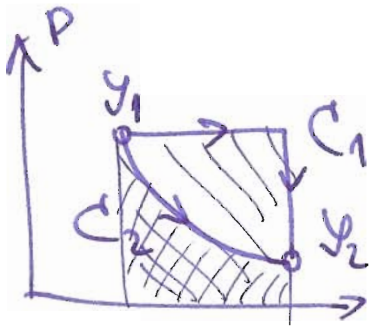
$$\Delta U = Q - W$$

$$\Delta Q = \Delta U + \Delta W$$

ó, hrůto: $\delta Q = dU + \delta W$

$$\int_{I\,(C_1)}^{II} \delta Q = \int_{I\,(C_1)}^{II} dU + \int_{I\,(C_1)}^{II} \delta W$$

C_1, C_2, C_3, ...



$dU = 0$

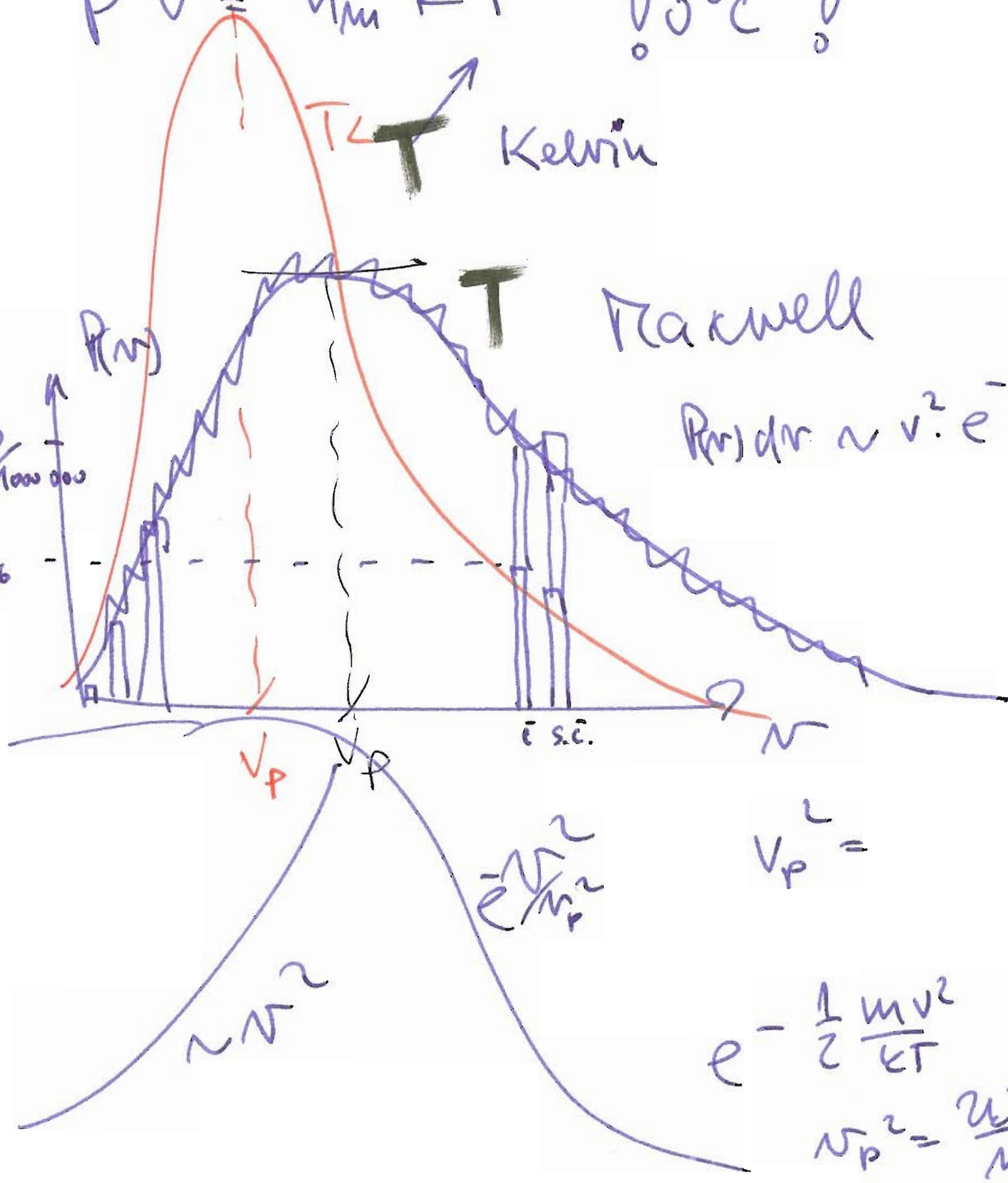
STAV versus DĚJ

(energie) × (práce, teplo)

Stan idealnego gazu:

$PV = n_m RT$!0°C!

MNW



$P(v)dv \sim v^2 \cdot e^{-\frac{v^2}{v_p^2}}$

e^{-v^2/v_p^2}

$v_p^2 =$

$e^{-\frac{1}{2}\frac{mv^2}{kT}}$

$v_p^2 = \frac{2kT}{m}$

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$$pV = n_m RT = \frac{N}{N_A} RT = NkT$$

($\frac{R}{N_A} = k$)

$$p = \frac{N}{V} kT = nkT$$

N … počet částic, V … objem, n … koncentrace

„IZO“ DĚJE

→ p = konst
→ T = –"–
→ V = –"–

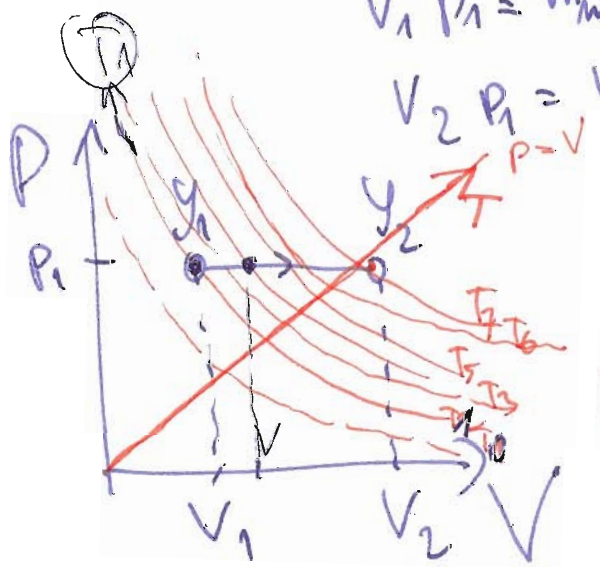
a) izobarický děj … p = konst

$pV = n_m RT$ $n_m = 1$

$V_1 p_1 = n_m R T_1$

$V_2 p_1 = n_m R T_2$

$$\frac{T_1}{V_1} = \frac{T_2}{V_2} = \text{konst}$$



$p = \frac{\text{konst}}{V}$

$p_1 V_1 = n_m R T_1$

b) izotermický děj T = konst:

$pV = n_m RT$ = konst

$$p = \frac{n_m RT}{V} = \frac{k}{V}$$

$y = \frac{1}{x}$, $y = \frac{2}{x}$, …

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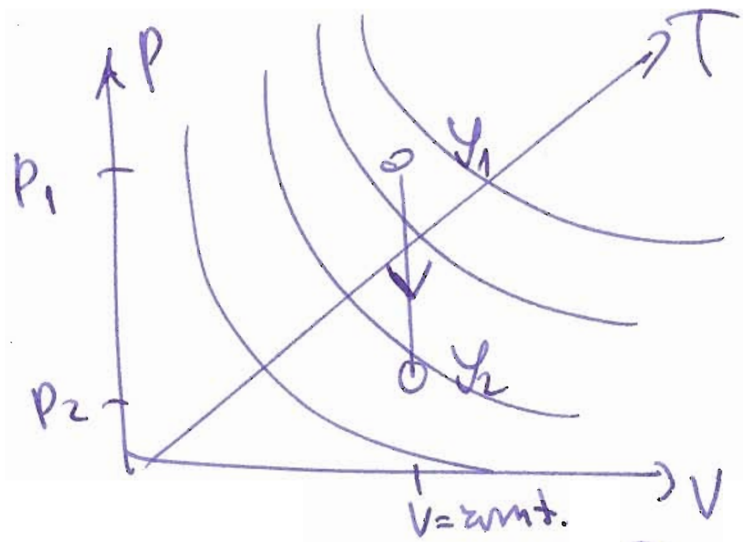
c) izochorický $V = konst$



$p_1 V_1 = n_m R T_1$

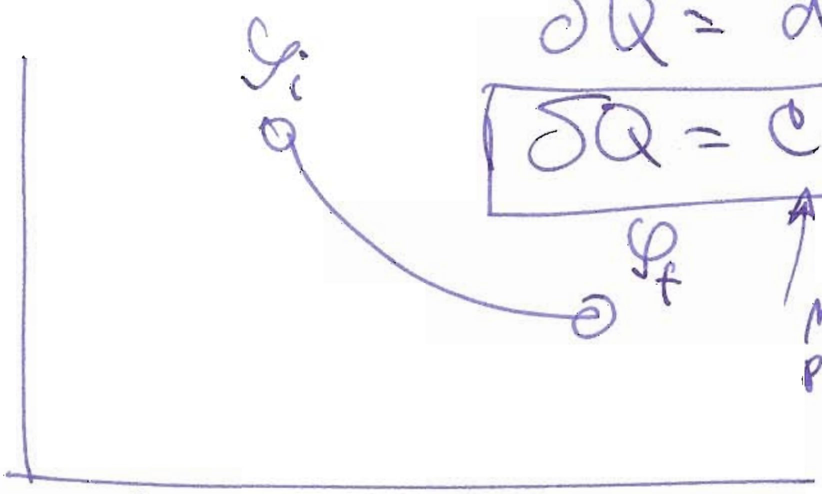
$p_2 V_1 = n_m R T_2$

$$\frac{p_1}{T_1} = \frac{p_2}{T_2}$$

$$p_2 = p_1 \frac{T_2}{T_1}$$

1 mol:

1. VT



$$\delta Q = dU + \delta W$$

$$\boxed{\delta Q = c_V \, dT + p\, dV}$$

měrné teplo při stálém objemu (1 mol)

energie ideálního plynu:

$U = kT$

$$c_V = \left(\frac{\delta Q}{dT}\right)_{V=konst} = \frac{dU}{dT}$$

$U = c_V T$

$dU = c_V \, dT$

$\delta Q = c_V \, dT \Rightarrow$

$$c_V = \frac{\delta Q}{dT}$$

DÚ

ΔQ

ΔU

ΔW

$\delta W = F \cdot dx$

$= p \cdot S \Delta x = p\,dV$