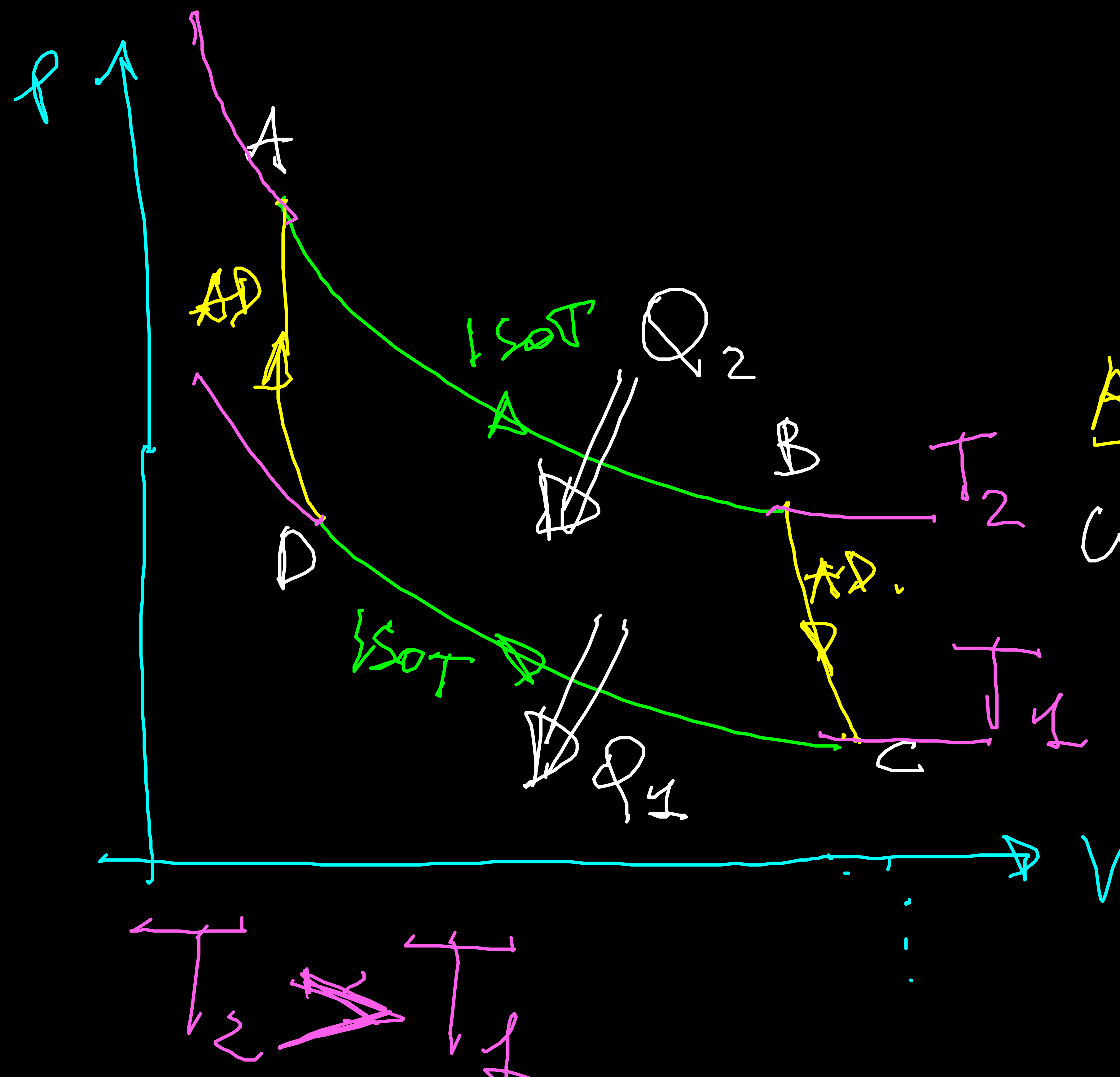
CICLO DI CARNOT



$$\eta = 1 - \frac{n R T_1 \ln \frac{V_C}{V_D}}{n R T_2 \ln \frac{V_B}{V_A}} = 1 - \frac{T_1}{T_2} \frac{\ln \frac{V_C}{V_D}}{\ln \frac{V_B}{V_A}}$$

ADIAB

$$cost = pV^\gamma = pVV^{\gamma-1} =$$

$$= nRTV^{\gamma-1} \Rightarrow TV^{\gamma-1} = cost$$

$$B \to C \quad T_1 V_C^{\gamma-1} = T_2 V_B^{\gamma-1}$$

$$D \to A \quad T_1 V_D^{\gamma-1} = T_2 V_A^{\gamma-1}$$

$$\eta = 1 - \frac{|Q_1|}{Q_2}$$

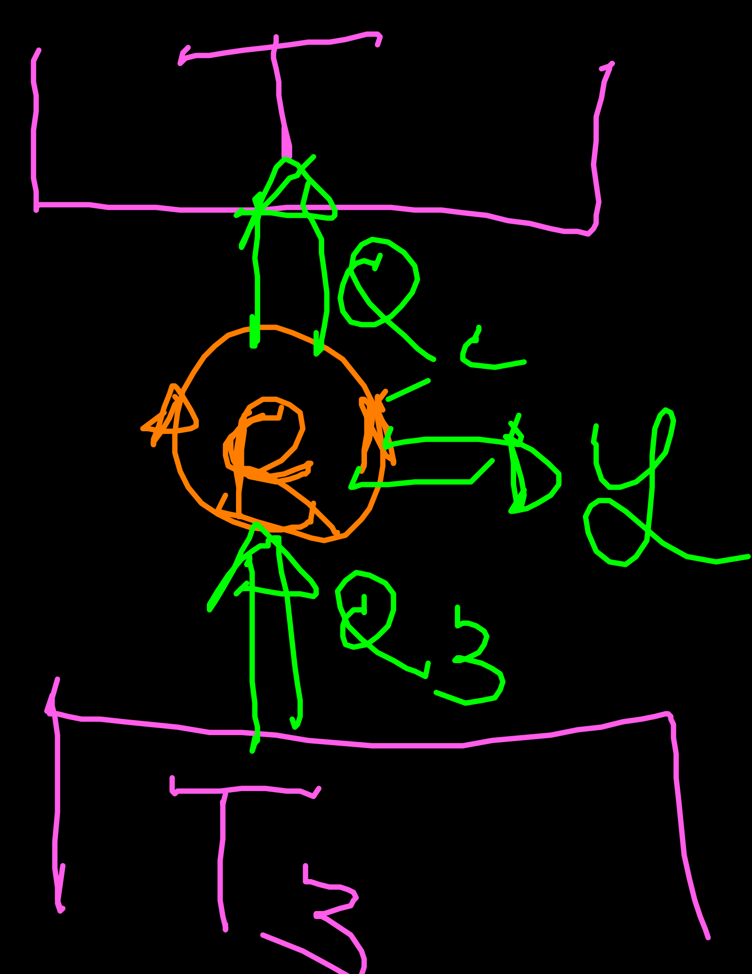
Rapporto

$$\left(\frac{V_C}{V_D}\right)^{\gamma-1} = \left(\frac{V_B}{V_A}\right)^{\gamma-1} \Rightarrow \frac{V_C}{V_D} = \frac{V_B}{V_A}$$

Rendimento di un ciclo di Carnot (tra due sole sorgenti)

$$\eta_C = 1 - \frac{T_F}{T_C} > \eta_{irr}$$

Temperatura Termodinamica



$$\eta_C = 1 - \frac{|Q_3|}{Q_C} = 1 - \frac{T_3}{T} = \eta_R$$

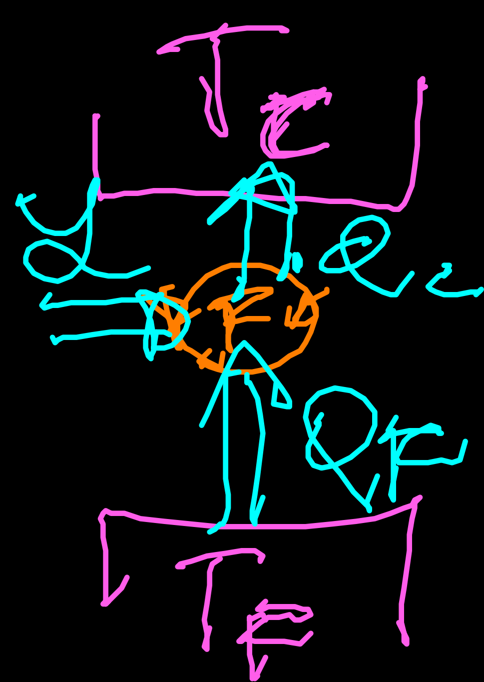
$$\frac{T}{T_3} = \frac{Q_C}{|Q_3|} \Rightarrow T = (273.16\ K)\,\frac{Q_C}{|Q_3|}$$

TEMP. TERMODIN. ASSOLUTA

T_3 = punto triplo dell'acqua → 273.16 K

Per una macchina frigorifera rev:

$$K = \frac{Q_F}{|L|} = \frac{Q_F}{|Q_C| - Q_F} = \frac{T_F}{T_C - T_F}$$



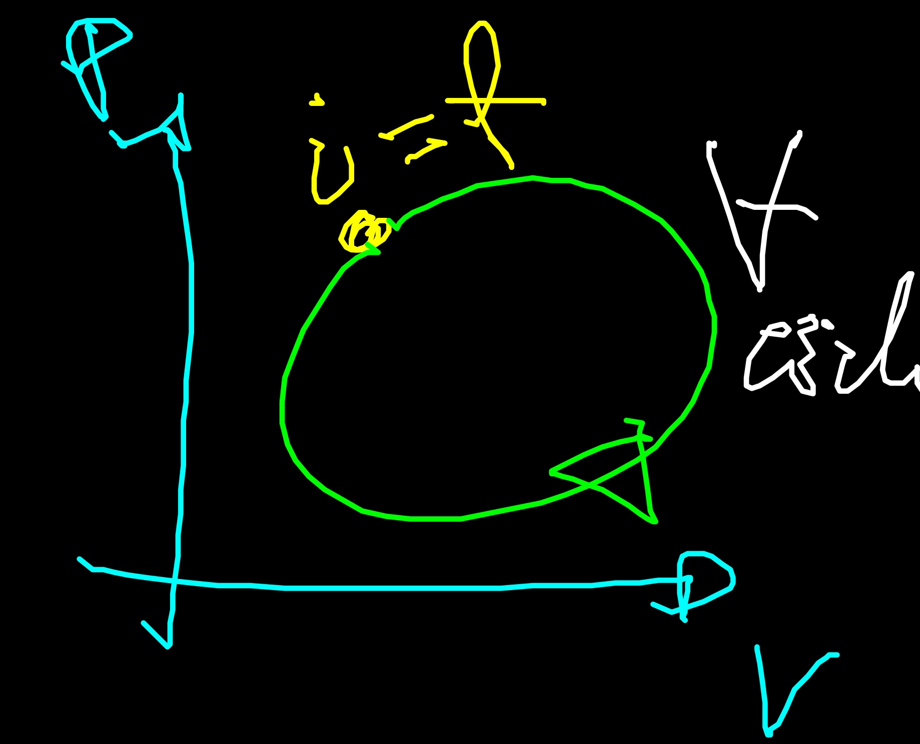
$$\frac{T_F}{T_C} = \frac{Q_F}{|Q_C|}$$

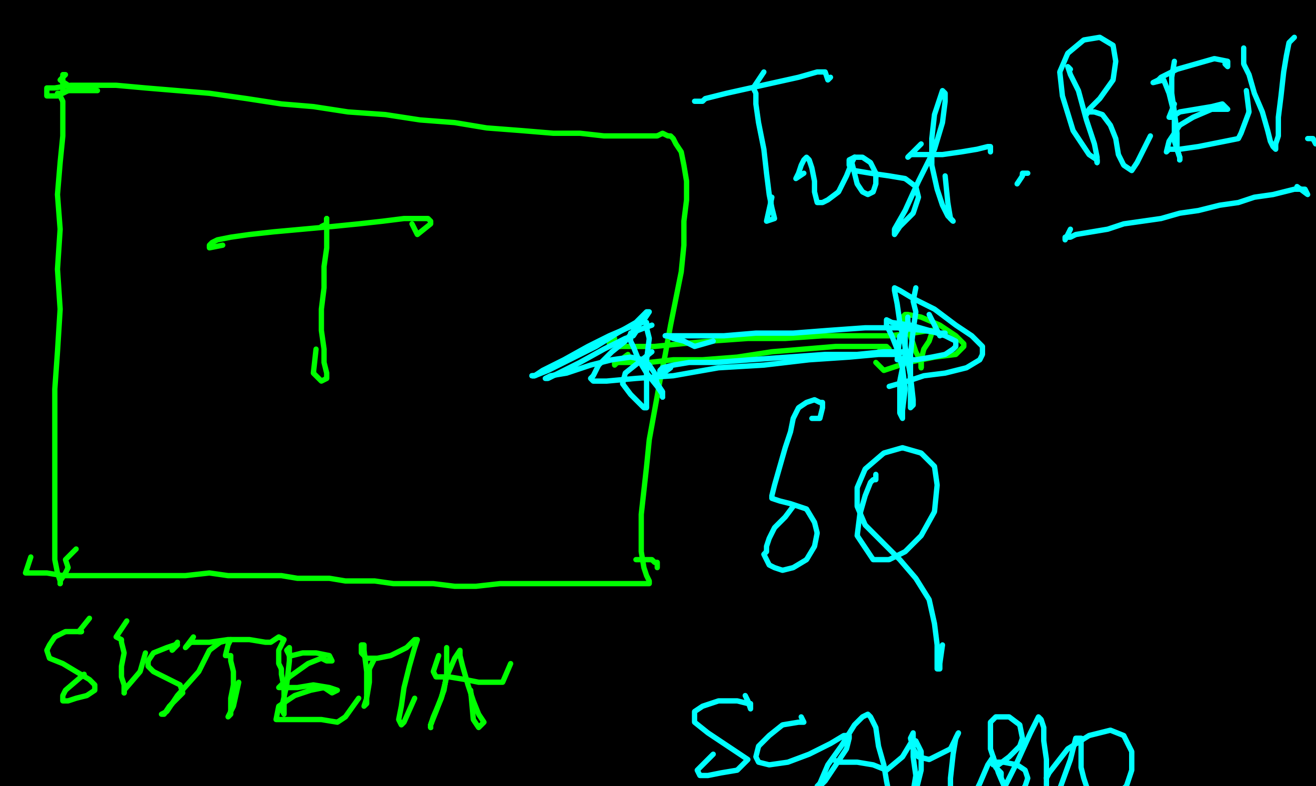
$T_C - T_F$ → Coeff. di prestazione massimo possibile

ENTROPIA

→ Variabili di stato $(P, V, T, U \ldots)$ $\Longleftrightarrow$ $\forall$ ciclo $i \to f$

$\Delta P = 0$
$\Delta U = 0$
$\Delta T = 0$
$\Delta V = 0$





$$dS = \frac{\delta Q}{T}$$

VARIAZIONE DI ENTROPIA

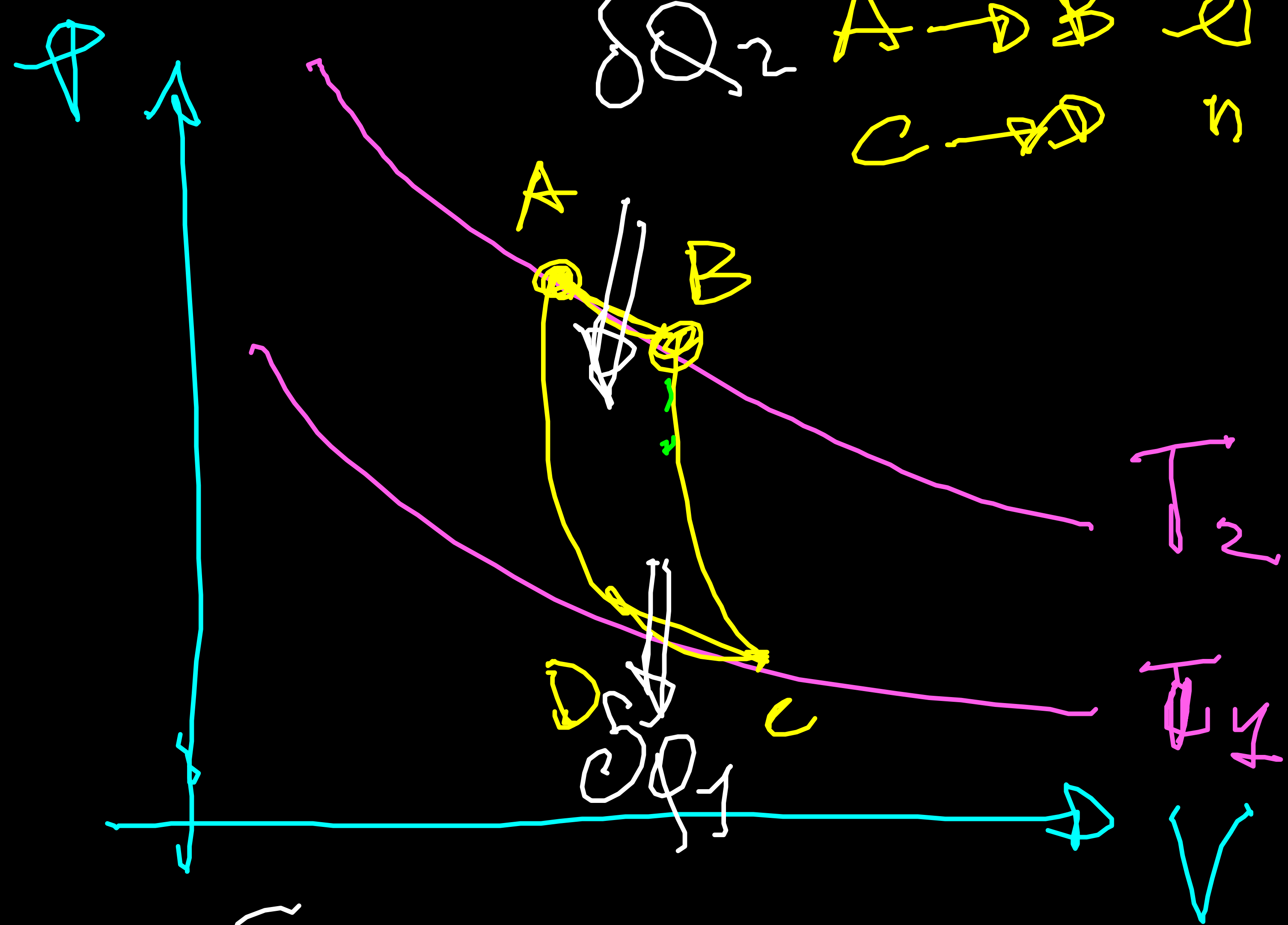
$\Delta S = 0$ SU UN CICLO?

PER UNA TRASF. FINITA REV.

$$\Delta S = \int_i^f \frac{\delta Q}{T} = S_f - S_i$$

δQ_2 $A \to B$ [illegible]

$C \to D$ " "



$\delta Q_1 < 0$

$\delta Q_2 > 0$

$$\frac{\delta Q_2}{|\delta Q_1|} = \frac{T_2}{T_1} \Rightarrow \frac{\delta Q_2}{T_2} = \frac{|\delta Q_1|}{T_1}$$

$$\frac{\delta Q_2}{T_2} - \frac{|\delta Q_1|}{T_1} = 0 = \frac{\delta Q_2}{T_2} + \frac{\delta Q_1}{T_1}$$

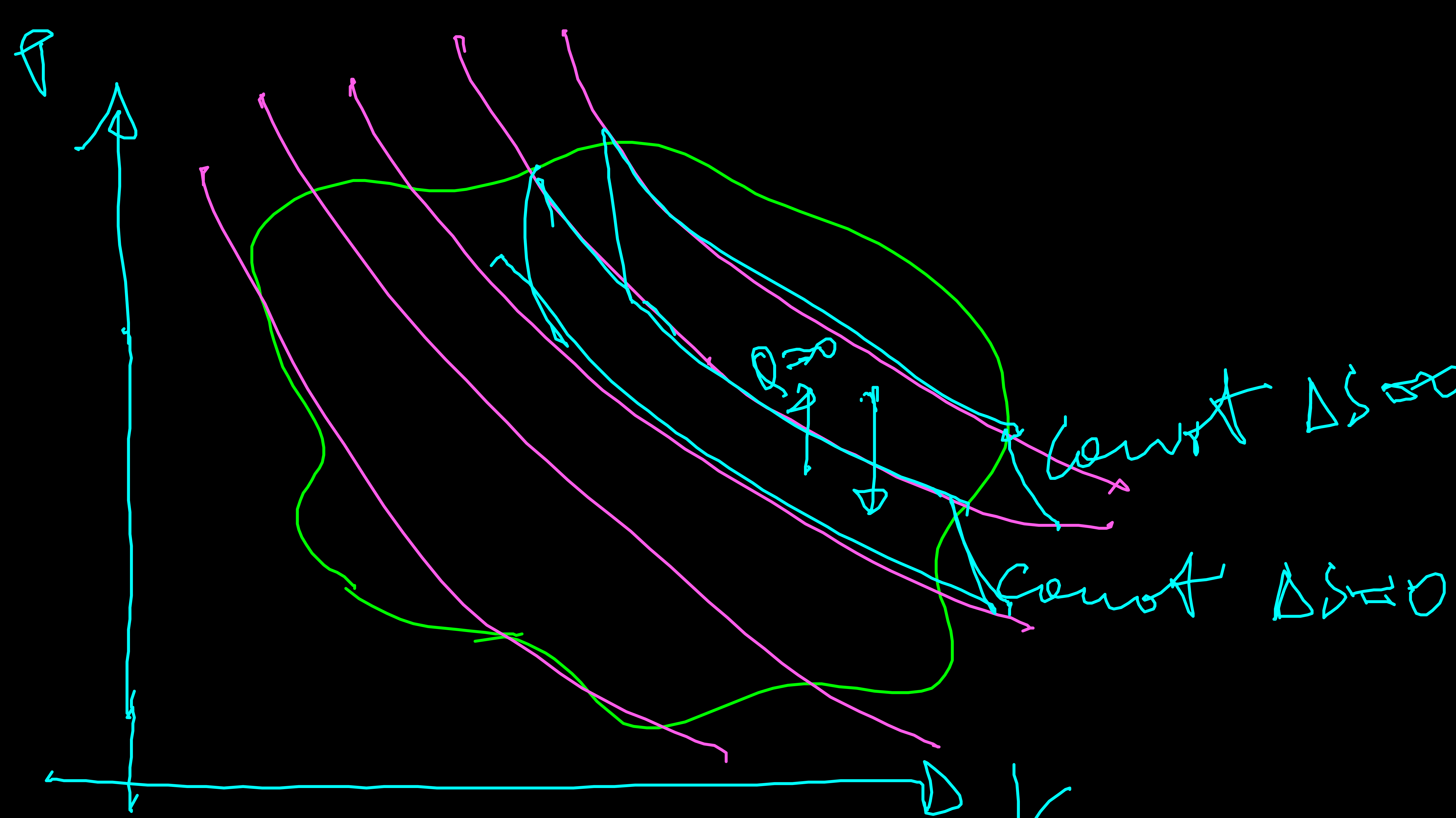
dS_2 ↑ , dS_1 ↑

$dS_{AD} = 0$

perché $\delta Q = 0$

PER UN CICLO DI CARNOT ← $0 = dS_2 + dS_1$

$\Delta S = 0$



L'ENTROPIA È UNA FUNZIONE DI STATO

∀ CICLO → SOMMA DI CICLI DI CARNOT

$\Delta S = 0$

$\Delta S = 0$ →