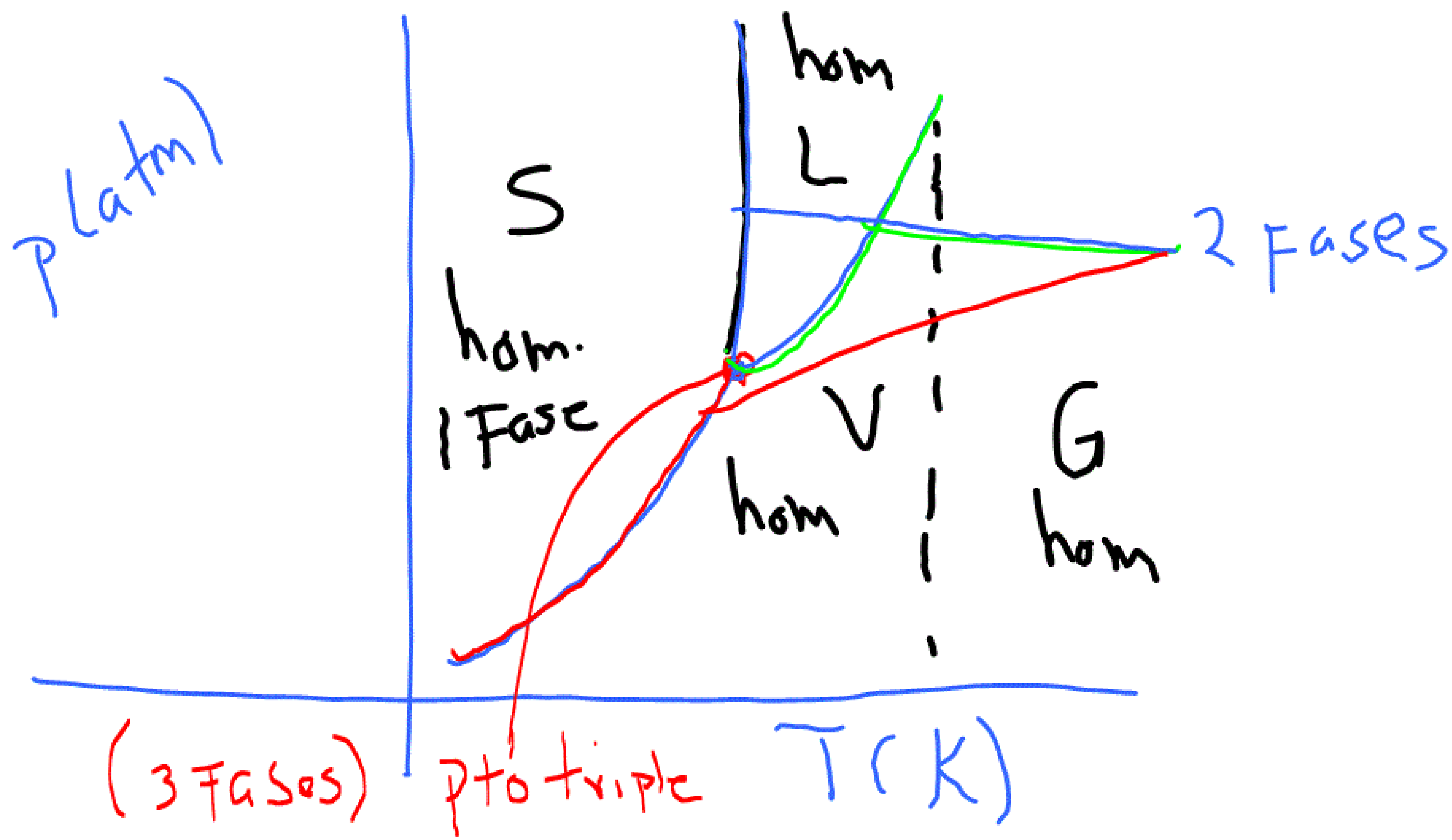
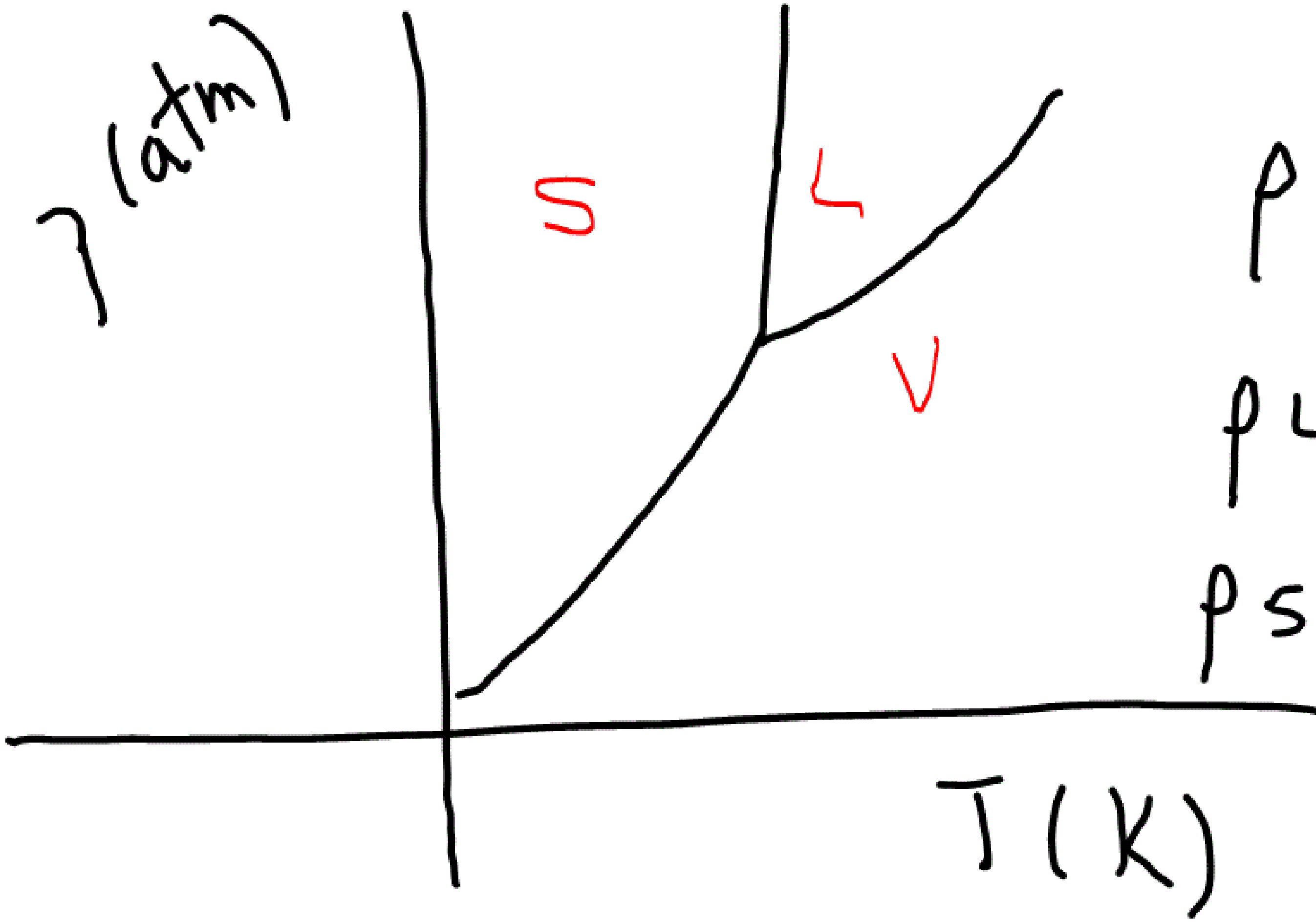
Clase 63 1 diciembre 2021

Título de la nota 01/12/2021



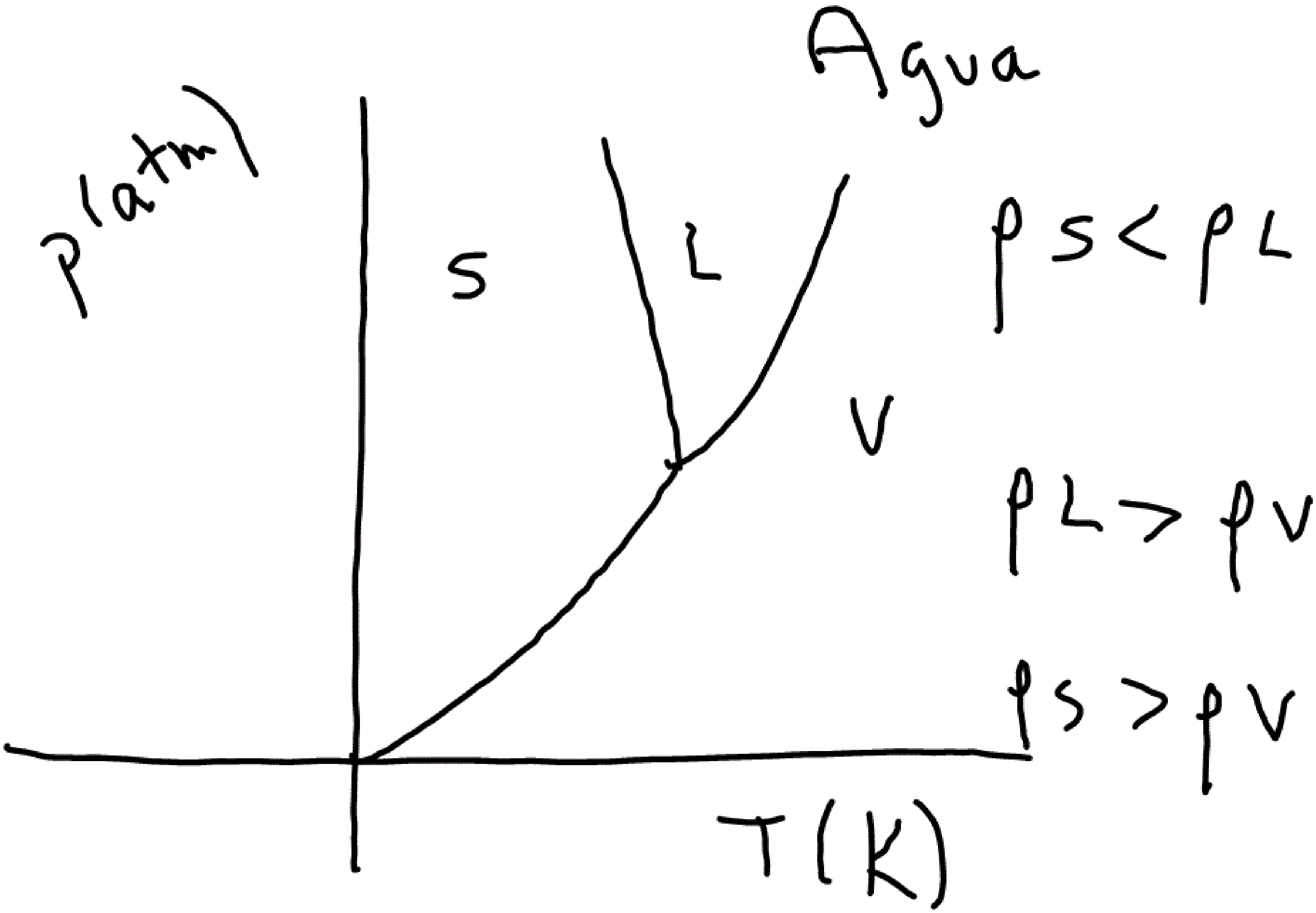
Cambio de Fase a p y T = cte



$\rho_S > \rho_L$

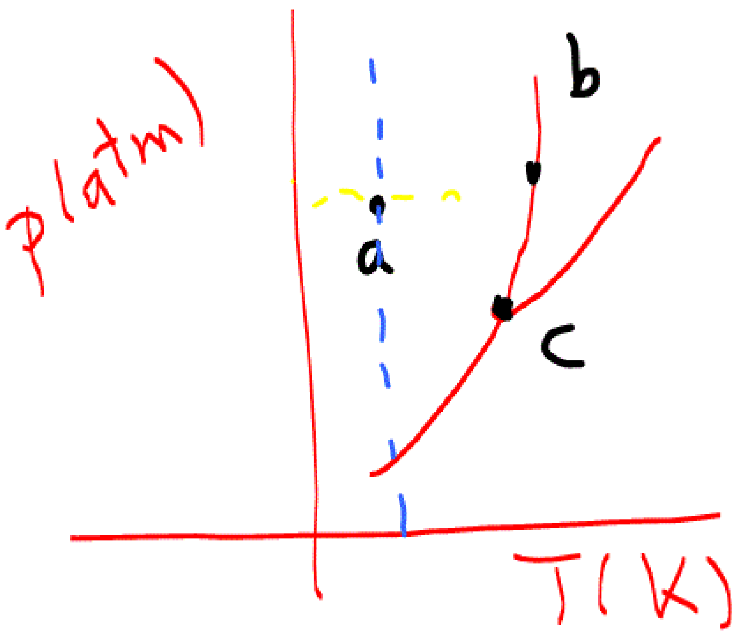
$\rho_L > \rho_V$

$\rho_S > \rho_V$


Agua
p(atm)
S
L
V
T(K)
ρS < ρL
ρL > ρV
ρS > ρV

Regla de las fases (Gibbs)

$$g.l. = C - F + 2$$



Sustancia pura

$C = 1$

$$g.l = C - F + 2$$

a)

$$= 1 - 1 + 2$$

$$= 2$$ bivariante

necesitan 2 variables intensivas

g.l = C − F + 2
b)
= 1 − 2 + 2

= 1 univariante

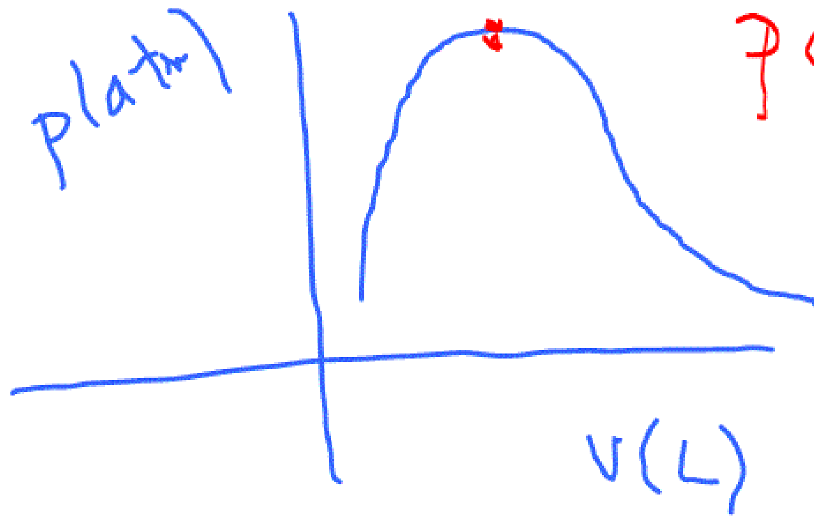
necesito 1 variable intensiva

g.l. $= C - F + 2$

c)

$= 1 - 3 + 2$

$= 0$ Invariante



PC = punto triple

agua

$$2H_2O \rightleftharpoons H_3O^+ + OH^-$$

① ② ③

Componentes = # especies − Rest.

= 3 − 2 = 1 ✓

Cambio de Fase
potencial químico

p y $T = cte$

equilibrio $\boxed{d\bar{G} = \bar{V}dp - \bar{S}dT} = 0$

μ = potencial químico $= d\bar{G}$

Vaporización

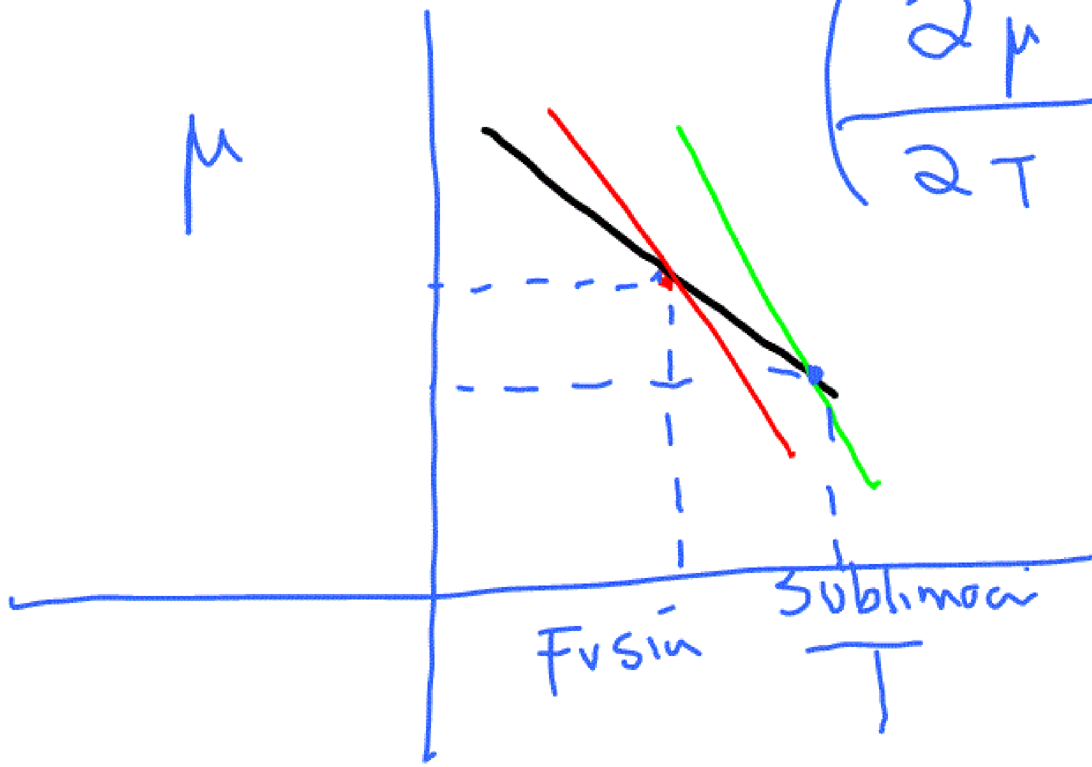
$\mu_L = \mu_V \therefore d\bar{G}_L = d\bar{G}_V$

μ vs T

$$\mu = \bar{V}\,dP - \bar{S}\,dT$$

$$\left(\frac{\partial \mu}{\partial T}\right)_P = -\bar{S}$$

$$\bar{S}_V > \bar{S}_L > \bar{S}_S$$



$$\mu_V = \mu_L$$

$$\bar{V}_V dp - \bar{S}_V dT = \bar{V}_L dp - \bar{S}_L dT$$

$$\bar{V}_V dp - \bar{V}_L dp = \bar{S}_V dT - \bar{S}_L dT$$

$$(\bar{V}_V - \bar{V}_L) dp = (\bar{S}_V - \bar{S}_L) dT$$

$$\Delta V_V dp = \Delta \bar{S}_V dT \qquad \boxed{\Delta \bar{V}_V = \bar{V}_V}$$

$$\bar{V}_V dp = \Delta \bar{S}_V dT$$

$$\bar{V}_v = \frac{R\bar{T}}{P}$$

$$\Delta\bar{S}_v = \frac{\Delta\bar{H}_v}{T}$$

$$\frac{RT}{P}\,dp = \Delta\bar{S}_v\,dT$$

$$\frac{RT}{P}\,dp = \frac{\Delta\bar{H}_v}{T}\,dT$$

$$RT\,\frac{dp}{P} = \Delta\bar{H}_v\,\frac{dT}{T}$$

$$RT\,\frac{dP}{P} = \Delta\bar{H}_v\,\frac{dT}{T}$$

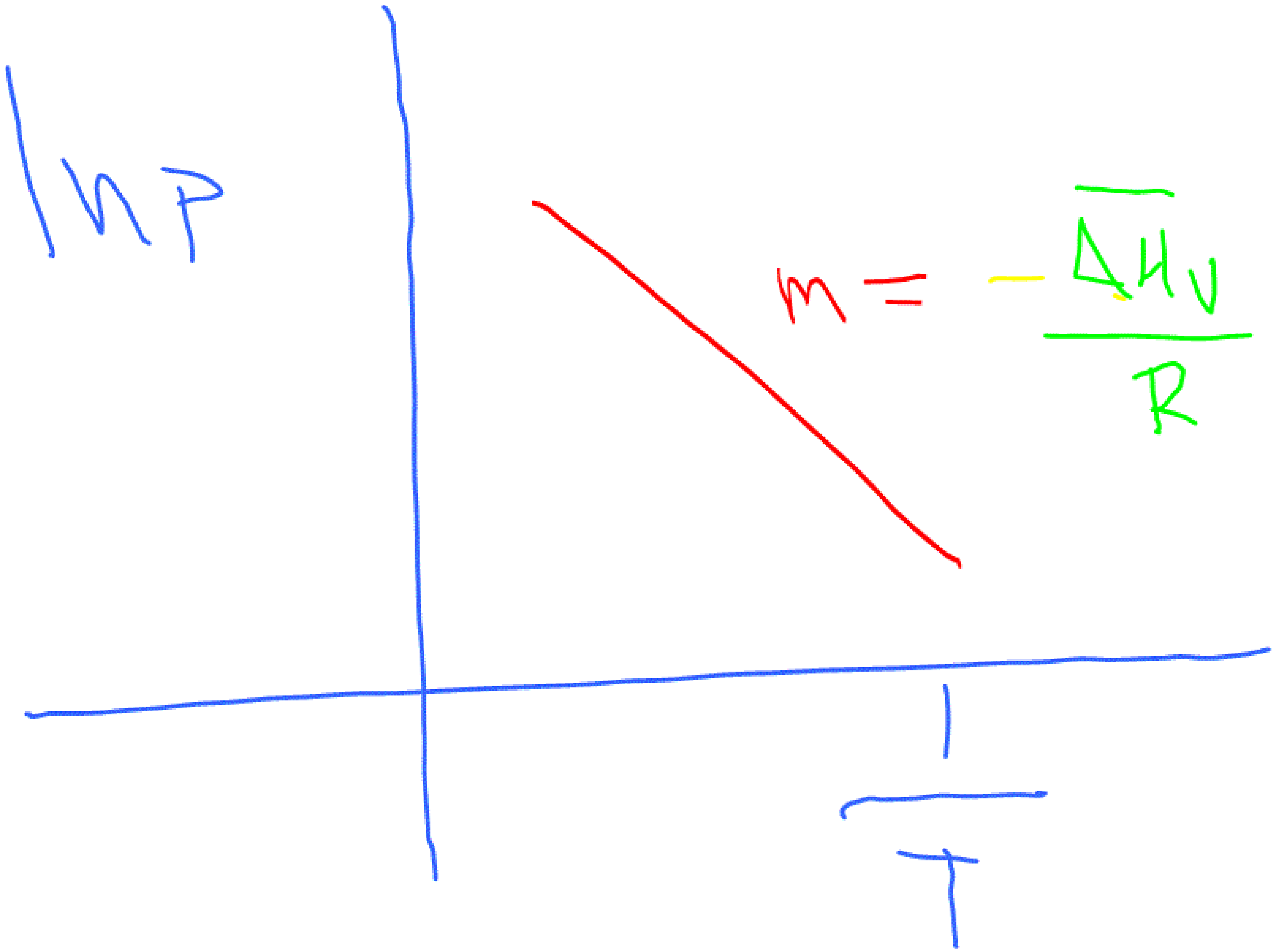
$$\int_{P_1}^{P_2}\frac{dP}{P} = \frac{\Delta\bar{H}_v}{R}\int_{T_1}^{T_2}\frac{dT}{T^2}$$

$$\ln\frac{P_2}{P_1} = \frac{\Delta\bar{H}_v}{R}\left[\frac{1}{T_1}-\frac{1}{T_2}\right]$$

$$\ln \frac{P_2}{P_1} = \frac{\Delta H_s}{R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

sublimación

$$\ln P = -\frac{\Delta H_v}{RT} + C$$



ln P
m = − ΔH̄v / R
1/T

S – L Fusión

$$\mu_S = \mu_L$$

$$\bar{V}_S dp - \bar{S}_S dT = \bar{V}_L dp - \bar{S}_L dT$$

$$(\bar{V}_L - \bar{V}_S) dp = (\bar{S}_L - \bar{S}_S) dT$$

$$(\bar{V}_L - \bar{V}_S) dp = \Delta \bar{S}_F \; dT$$

$$(\bar{V}_L - \bar{V}_S)\, dp = \overline{\Delta S}_F \, dT$$

$$= \frac{\overline{\Delta H}_F}{T} \, dT$$

$$\int_{p_1}^{p_2} dp = \frac{\overline{\Delta H}_F}{(\bar{V}_L - \bar{V}_S)} \int_{T_1}^{T_2} \frac{dT}{T}$$

$$p_2 - p_1 = \frac{\overline{\Delta H}_F}{(\bar{V}_L - \bar{V}_S)} \ln \frac{T_2}{T_1}$$

$$P_2 - P_1 = \frac{\overline{\Delta H}_F}{(\bar{V}_L - \bar{V}_S)} \ln \frac{T_2}{T_1}$$

$$Pa = \frac{N}{m^2} = \frac{J/mol}{\frac{m^3}{mol}} \qquad \frac{N \cdot \cancel{m} / \cancel{mol}}{\frac{m^{\cancel{3}\,2}}{\cancel{mol}}}$$

$$\frac{N}{m^2} = \frac{N}{m^2}$$

Vaporización

$T_1 = TNe \quad TNE$

$= 1 atm = 373.15 K$

Fusión (Agua)

$T_1 = TNF \; 1 atm$

$= 273.15 K$

Fusión Vap

P 1 = 1atm, 760 mmHg

1.013×10^5 Pa

1.01325×10^5 Pa

$$\ln \frac{P_2}{P_1} = \frac{\overline{\Delta H_v}}{R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

$$\ln p = \frac{\overline{\Delta H_v}}{RT_1} - \frac{\overline{\Delta H_v}}{RT_2}$$

$$\ln p = A - \frac{B}{T + C}$$

Antoine