Exercise 8-13

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$\ln(p) = 0.04 - \frac{6}{T}$ sublimation

$\ln(p) = 0.03 - \frac{4}{T}$ vaporization

p in atm

triple point: same p and same T

$0.04 - \frac{6}{T} = 0.03 - \frac{4}{T}$

$0.01 = \frac{6}{T} - \frac{4}{T}$

$0.01 = \frac{2}{T}$

$T = \frac{2}{0.01} = 2 \times 100 = 200\ K$

$\left(\frac{dp}{dT}\right)_{23} = \frac{l_{23}}{T(v_3 - v_2)}$

$l_{23} = \left(\frac{dp}{dT}\right)_{23} T(v_3 - v_2)$

$v_3 \gg v_2 \Rightarrow v_3 - v_2 = v_3$

$l_{23} = \frac{4p}{T} v_3 = \frac{4p}{T} \frac{RT}{p} = 4R$ for an ideal gas

$\ln(p) = 0.03 - \frac{4}{T}$

$\frac{d}{dT} \ln(p) = \frac{d}{dT}\left(0.03 - \frac{4}{T}\right)$

$\frac{1}{p} \frac{dp}{dT} = \frac{4}{T^2}$

$\frac{dp}{dT} = \frac{4p}{T^2}$

$\ln(p) = 0.04 - \frac{6}{T}$

$\frac{1}{p} \frac{dp}{dT} = \frac{6}{T^2}$

$\frac{dp}{dT} = \frac{6p}{T^2}$

$v_3 - v_1 = v_3$

$l_{13} = \left(\frac{dp}{dT}\right)_{13} T(v_3 - v_1) = \frac{6p}{T^2} T v_3$

$= \frac{6p}{T} \frac{RT}{p} = 6R$

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b) $l_{12} + l_{23} + l_{31} = 0$

$l_{12} = -l_{31} - l_{23} = l_{13} - l_{23} = 6R - 4R = 2R$