Prove: $p = p^* e^{V_m \Delta \underline{P}/RT}$

where p^* is the vapour pressure in absence of additional pressure, and p is the vapour pressure after $\Delta \underline{P}$

At eqb. $\mu(l) = \mu(g)$
so for infinitessimal changes:

$$d\mu(l) = d\mu(g)$$

→ if the pressure on a liquid is increased by $d\underline{P}$

$$d\mu(l) = V_m(l)\, d\underline{P} \quad \text{(change in applied pressure)}$$
$$d\mu(g) = V_m(g)\, dp \quad \text{(change in vapour pressure)}$$

For an ideal gas, $V_m = RT/p$, so at eqb:

$$\frac{RT\,dp}{p} = V_m(l)\, d\underline{P}$$

- when no pressure on liquid $\underline{P} = p^*$, and $p = p^*$
- when additional pressure applied, $\Delta \underline{P}$, then

$$\underline{P} = p + \Delta \underline{P}$$

(p is the final pressure we want to find)

- the effect on this additional pressure, $\Delta \underline{P}$, on p is small, so to a good approx: $p \approx p^*$

Thus, we integrate:

$$RT \int_{p^*}^{p} \frac{dp}{p} = \int_{p^*}^{p^* + \Delta \underline{P}} V_m(l)\, d\underline{P}$$

$$RT \ln(p/p^*) = V_m(l)\Delta \underline{P}$$

$$p/p^* = e^{V_m(l)\Delta \underline{P}/RT}; \quad \boxed{p = p^* e^{V_m(l)\Delta \underline{P}/RT}}$$