المعادلة 10 :

$$p(V-b)\exp\left(\frac{a}{rTV}\right) = rT \quad \text{---} (1)$$

حساب α :

$$\alpha = \frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$$

من (1) :

$$\ln p + \ln(V-b) + \frac{a}{rTV} = \ln r + \ln T \quad \text{---} (*)$$

بتفاضل (*) بثبوت p :

$$\frac{dp}{p} + \frac{dV}{V-b} - \frac{a\,dV}{rTV^2} - \frac{a\,dT}{rT^2V} = \frac{dT}{T}$$

$$\left(\frac{1}{V-b} - \frac{a}{rTV^2}\right)dV = dT\left(\frac{1}{T} + \frac{a}{rT^2V}\right)$$

$$\frac{dV}{dT} = \frac{\frac{1}{T}\left(1+\frac{a}{rTV}\right)}{\frac{1}{V-b} - \frac{a}{rTV^2}}$$

ومنه :

$$\alpha = \frac{1}{V}\left[\frac{1}{T}\left(\frac{\left(1+\frac{a}{rTV}\right)}{\frac{1}{V-b} - \frac{a}{rTV^2}}\right)\right]$$

أو :

$$\alpha = \frac{1}{T}\times\frac{1}{V}\left[\frac{\left(1+\frac{a}{rTV}\right)}{\left[\frac{1}{V\left(1-\frac{b}{V}\right)} - \frac{a}{rTV}\right]}\right]$$

$$\boxed{\alpha = \frac{1}{T}\times\left[\frac{1+\frac{a}{rTV}}{(1-\frac{b}{V})^{-1} - \frac{a}{rTV}}\right]}$$