3b cont) so that $\left[\frac{d}{dq}\left(\frac{2\alpha q}{q^2-\alpha^2}\right)\right]_{q=q_0} = -\frac{2}{\alpha}\left(\frac{q_0^2+\alpha^2}{q_0^2-\alpha^2}\right)^2$

and $\frac{1}{\cos^2 q_0 L} = 1 + \tan^2 q_0 L = \left(\frac{q_0^2+\alpha^2}{q_0^2-\alpha^2}\right)^2$

$$\Rightarrow \cos q_0 L = \frac{\hbar^2 q_0^2 - mV_0}{mV_0}$$

or, with $q_0 L = u$ $\quad \cos u = \frac{\hbar^2 u^2/L^2 - mV_0}{mV_0}$

This requirement, along w/ above eq'ns

$$\Rightarrow \xi = \frac{-2q_0\alpha}{q_0^2+\alpha^2}\,\frac{\alpha}{2+L\alpha}\,\eta$$

The odd sol'n is only diff. in that the sign of η is opposite. Thus, the even/odd sol'ns are equally apart from q_0 & their diff. is 2ξ

$$\therefore\ q_1^2 - q_2^2 = \frac{2m}{\hbar^2}\Delta E = 2\xi q_0 = -\frac{4q_0^2\alpha^2}{q_0^2+\alpha^2}\,\frac{1}{2+L\alpha}\,e^{-2b\alpha}$$