15.05 Blatt 5

Theo-Ü Nr. 3

$$V(x) = V_0\left(\delta(x+a) + \delta(x-a)\right) \qquad V_0 < 0,\ a > 0$$

$$\Rightarrow \psi_\pm(x) = \begin{cases} A e^{kx} + A' e^{-kx} & x \le -a \\ B e^{kx} \pm B' e^{-kx} & -a \le x \le a \\ \pm A e^{-kx} \pm A' e^{kx} & x \ge a \end{cases}$$

a) Normierbarkeit: $A' = 0$

b) Stetig bei $x = \pm a$

$x = -a \Rightarrow B = A \frac{1}{1 \pm e^{-2ka}}$

c) z.z. $e^{-2ka} = \pm\left(1 + \frac{2k}{\mu}\right) \qquad \mu = \frac{2mk}{\hbar^2}$

Stationäre SGL:

$$-\frac{\hbar^2}{2m} \partial_x^2 \psi_\pm + V(x)\psi_\pm = E\psi_\pm$$

Integration über x von $x = \pm a - \varepsilon$ bis $x = \pm a + \varepsilon$:

$$\Rightarrow A k e^{-ka} - B k e^{ka} \pm B k e^{-ka} = \frac{2mk}{\hbar^2}\left(\pm A e^{-ka}\right.$$

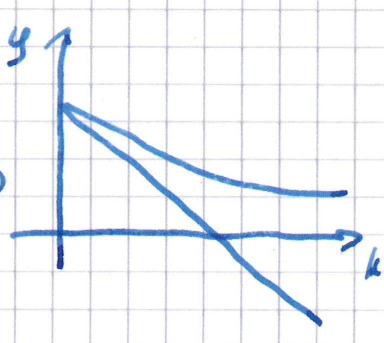
$$\Rightarrow e^{-2ka} = \pm\left(1 + \frac{2k}{\mu}\right)$$

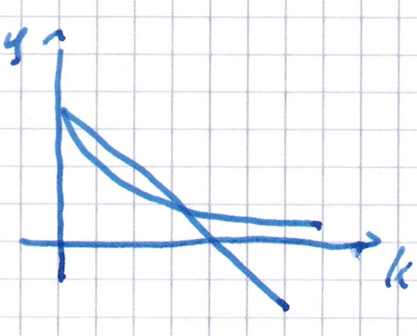
d)

(1) $y_1 = e^{-2ka}$

$y_2 = 1 + \frac{2k}{\mu}$

$\Rightarrow$





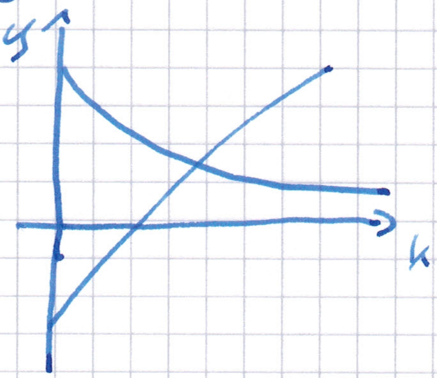
$\Rightarrow a$ muss groß genug sein.

$$\Rightarrow \frac{d}{dk} y_1\Big|_{k=0} < \frac{d}{dk} y_2\Big|_{k=0}$$

$$\Rightarrow -2a < \frac{2}{\mu}$$

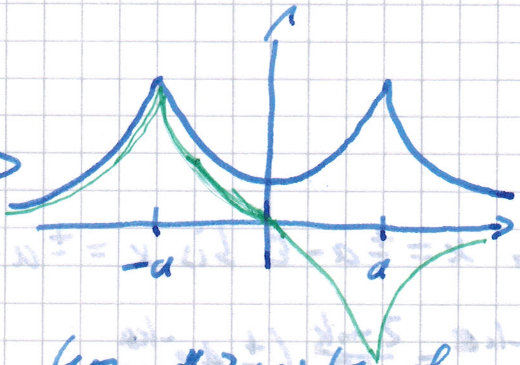
$$\Rightarrow -a < \frac{1}{\mu}$$

2



analog

$\Rightarrow$



Grundzustand

angeregter Zustand