2 b)

$$x_0 = 1 \qquad x_1 = \phi(x_0) = \frac{3}{2}$$

$$e_k = \| x - x_k \| \leq \frac{\alpha^k}{1 - \alpha} \| x_1 - x_0 \| \stackrel{!}{\leq} 10^{-6}$$

$$\Rightarrow \qquad \alpha^k \leq \frac{10^{-6}\,(1-\alpha)}{\| x_1 - x_0 \|}$$

$$\Rightarrow \qquad k \geq \ln\left(\frac{10^{-6}\,(1-\alpha)}{\| x_1 - x_0 \|} \right) \cdot \frac{1}{\ln(\alpha)}$$

Für $\alpha = \frac{1}{4}$:

$$k \geq \ln\left(\frac{7,5 \cdot 10^{-7}}{0,5} \right) \cdot \frac{1}{\ln(0,25)}$$

$$\Rightarrow \quad k \geq 9,67$$

Also, da $k \in \mathbb{N}$:

$$k \geq 10$$