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Ex 2

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Task 1) $$J = \sum_{n=1}^{N} \sum_{k=1}^{N} r_{nk} (x_n - \mu_k)^2$$

The given function is quadratic with respect to $\mu_k$

to minimize that we put the derivative w.r.t. $\mu_k$ to zero

$$\frac{\partial J}{\partial \mu_k} = 2 \sum_{n=1}^{N} r_{nk} (x_n - \mu_k) = 0 \Rightarrow \mu_k = \frac{\sum_{n}^{N} r_{nk} x_n}{\sum_{n}^{N} r_{nk}}$$