Expectation-Maximisation

1. The dataset `EM_var.npy` is generated by a Gaussian Mixture Model with 6 components.

    a. Implement the E-step of the EM algorithm.
    b. Implement the rest of the EM algorithm,
    c. then plot the results (with the components denoted by different colours), along with the found means.

2. The dataset `EM_equal.npy` is generated by a Gaussian Mixture Model with equal number of samples for each component (there are 4 Gaussian components). The covariance is the identity matrix.

    a. Similarly to Task 1, derive the EM algorithm, but with hard assignments. (Mathematically, this means for each i, the responsibilities α_{ij} will be 0, except for one j, where it is 1. Intuitively, this means every data point belongs to only one cluster at any timestep. (This can of course change through the iterations.))
    b. Implement the algorithm, then plot the results (with the components denoted by different colours).
    c. What are the conditions for the termination of the algorithm? How does it relate to the K-means algorithm?
    d. Run the general EM algorithm on this dataset (with soft assignment). Compare the two.