Aashaka Desai, Jack Maloy, Matthew Miller 

OUTPUT:

k = 1:

Mean: 15.48169 Variance: 67.51493

k = 3:

Mean: 5.50927 Variance: 0.99809

Mean: 15.44916 Variance: 0.96711

Mean: 25.48665 Variance: 1.03025

k = 5: // Output varies some depending on the randomized initial parameters

Mean: 4.50189 Variance: 0.53050

Mean: 5.87407 Variance: 0.71066

Mean: 15.15170 Variance: 1.03307

Mean: 15.62763 Variance: 0.84259

Mean: 25.48665 Variance: 0.99809

For initialization, we generated the k random means as k random number between the smallest number and largest number in the dataset, then calculated their variance according to each of their randomly generated means. The results are sometimes sensitive to the initial values, but that depends on the value of k.

I think the true k is k = 3. When run every time, although the initial 3 means are wildly different, it always converges to the same 3 means and variances. Also for 'Step 3' that test also always converges to the same 3 means, which gives us further confidence that the true k is indeed 3.

(Extra Credit): During our E-step we multiply the numerator and denominator by alpha, while we do not do that in the slides. Initially the sum of all alphas equals 1, but then each alpha is replaced by the mean of each weights corresponding to each k in subsequent iterations during the M step. This ensures when estimating the new weights, that the weights change less than they otherwise would have. With the alpha pulling the updating back a little bit.