

## K-means

1. Compute the new position of the cluster centres after 1 step of k-means. Data:  $\langle 1, 1 \rangle$ ,  $\langle 0, 2 \rangle$ ,  $\langle -1, 2 \rangle$ ,  $\langle 5, 6 \rangle$ ,  $\langle 7, 5 \rangle$ . Cluster centres:  $\langle -1, -1 \rangle$ ,  $\langle 4, 6 \rangle$ .
2. Same as (1), with the single cluster centre:  $\langle 1, -1 \rangle$
3. Same as (1), with data:  $\langle 1, 3 \rangle$ ,  $\langle 2, 2 \rangle$ ,  $\langle 3, -1 \rangle$ ,  $\langle 4, 2 \rangle$ ,  $\langle 5, -3 \rangle$ ,  $\langle 5, 4 \rangle$ ,  $\langle 4, 5 \rangle$ ,  $\langle 3, -6 \rangle$ ,  $\langle 2, 5 \rangle$ ; and centres:  $\langle 0, 1 \rangle$ ,  $\langle 0, -1 \rangle$ .