HW9.

1. 用单连接法进行层次聚类.

	X_1	X_2	X_3	X_4	X_5
X_1	0	6	2	9	3
X_2	6	0	5	4	6
X_3	2	5	0	8	1
X_4	9	4	8	0	5
X_5	3	6	1	5	0

① X_3 与 X_5 合并为一类.

	X_1	X_2	(X_3, X_5)	X_4
X_1	0	6	2	9
X_2	6	0	5	4
(X_3, X_5)	2	5	0	5
X_4	9	4	5	0

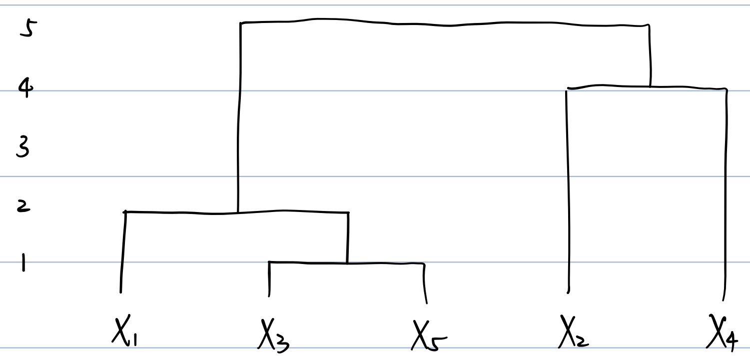
② X_1 与 (X_3, X_5) 合并为一类.

	(X_1, X_3, X_5)	X_2	X_4
(X_1, X_3, X_5)	0	5	5
X_2	5	0	4
X_4	5	4	0

③ X_2 与 X_4 合并为一类.

	(X_1, X_3, X_5)	(X_2, X_4)
(X_1, X_3, X_5)	0	5
(X_2, X_4)	5	0

④ 层次聚类停止, 画出树形图.



2.

X_1	0	2	
X_2	0	0	
X_3	1	0	
X_4	5	0	$\leftarrow C_1$
X_5	5	2.	$\leftarrow C_2$.

用欧式距离作为距离度量.

① $d(X_1, C_1) = \sqrt{5^2+2^2} = \sqrt{29}$, $d(X_1, C_2) = 5$ $\Rightarrow$ $X_1 : 2$.

$d(X_2, C_1) = 5$, $d(X_2, C_2) = \sqrt{5^2+2^2} = \sqrt{29}$. $\Rightarrow$ $X_2 : 1$.

$d(X_3, C_1) = 4$, $d(X_3, C_2) = \sqrt{4^2+2^2} = \sqrt{20}$. $\Rightarrow$ $X_3 : 1$.

第一次迭代: (X_2, X_3, X_4), (X_1, X_5).

$C_1 = \left(\frac{1}{3}(0+1+5), \frac{1}{3}(0+0+0)\right) = (2, 0)$ $C_2 = \left(\frac{1}{2}(0+5), \frac{1}{2}(2+2)\right) = (\frac{5}{2}, 2)$.

② $d(X_1, C_1) = \sqrt{2^2+2^2} = \sqrt{8}$. $d(X_1, C_2) = \sqrt{(\frac{5}{2})^2+0} = \frac{5}{2}$. $\Rightarrow$ $X_1 : 2$.

$d(X_2, C_1) = \sqrt{2^2+0} = 2$. $d(X_2, C_2) = \sqrt{(\frac{5}{2})^2+2^2} = \sqrt{\frac{41}{4}}$. $\Rightarrow$ $X_2 : 1$.

$d(X_3, C_1) = \sqrt{1+0} = 1$. $d(X_3, C_2) = \sqrt{(\frac{3}{2})^2+2^2} = \frac{5}{2}$. $\Rightarrow$ $X_3 : 1$.

$d(X_4, C_1) = \sqrt{3^2+0} = 3$. $d(X_4, C_2) = \sqrt{(\frac{5}{2})^2+2^2} = \sqrt{\frac{41}{4}}$. $\Rightarrow$ $X_4 : 1$.

$d(X_5, C_1) = \sqrt{3^2+2^2} = \sqrt{13}$. $d(X_5, C_2) = \sqrt{(\frac{5}{2})^2+0} = \frac{5}{2}$. $\Rightarrow$ $X_5 : 2$.

第二次迭代: (X_2, X_3, X_4), (X_1, X_5). 结果与第1次相同, 迭代结束.

$\therefore$ 综上, X_2, X_3, X_4 为一类, X_1, X_5 为另一类.