$sign\left(\vec{w}^{(12)T}\vec{x}_1\right) = 1 = y_1$， $\therefore$ $\vec{w}^{(13)} = \vec{w}^{(12)} = (-2,2,2)^T$

$sign\left(\vec{w}^{(13)T}\vec{x}_2\right) = 1 = y_2$， $\therefore$ $\vec{w}^{(14)} = \vec{w}^{(13)} = (-2,2,2)^T$

$sign\left(\vec{w}^{(14)T}\vec{x}_3\right) = 1 \neq y_3$， $\therefore$ $\vec{w}^{(15)} = \vec{w}^{(14)} + y_3\vec{x}_3 = (-3,1,1)^T$

$sign\left(\vec{w}^{(15)T}\vec{x}_1\right) = 1 = y_1$， $\therefore$ $\vec{w}^{(16)} = \vec{w}^{(15)} = (-3,1,1)^T$

$sign\left(\vec{w}^{(16)T}\vec{x}_2\right) = 1 = y_2$， $\therefore$ $\vec{w}^{(17)} = \vec{w}^{(16)} = (-3,1,1)^T$

$sign\left(\vec{w}^{(17)T}\vec{x}_3\right) = -1 = y_3$， $\therefore$ $\vec{w}^{(18)} = \vec{w}^{(17)} = (-3,1,1)^T$

$\therefore$ $\vec{w} = (-3,1,1)^T$, 分类面为：$x_1 + x_2 - 3 = 0$

对测试样本进行增广，$\vec{x} = (1,0,1)^T$，

$$sign\left(\vec{w}^T\vec{x}\right) = sign((-3,1,1)(1,0,1)^T = -1, \quad \therefore \ \vec{x} \in -1 \text{ 类}$$

2，对于感知器算法（PLA），假设第 t 次迭代时，选择的是第 n 个样本：$\text{sign}(\boldsymbol{w}^T\mathbf{x}_n) \neq y_n$，$\boldsymbol{w}_{t+1} \leftarrow \boldsymbol{w}_t + y_n\mathbf{x}_n$，下述那个式子正确？

（a）$\boldsymbol{w}_{t+1}^T\mathbf{x}_n = y_n$

（b）$\text{sign}\left(\boldsymbol{w}_{t+1}^T\mathbf{x}_n\right) = y_n$

（c）$y_n\boldsymbol{w}_{t+1}^T\mathbf{x}_n \geq y_n\boldsymbol{w}_t^T\mathbf{x}_n$

（d）$y_n\boldsymbol{w}_{t+1}^T\mathbf{x}_n < y_n\boldsymbol{w}_t^T\mathbf{x}_n$

3，证明：针对线性可分训练样本集，PLA 算法中，当$\mathbf{W}_0 = \mathbf{0}$，在对分错样本进行了 T 次纠正后，下式成立：$\frac{\mathbf{w}_f^T}{\|\mathbf{w}_f\|}\frac{\mathbf{w}_T}{\|\mathbf{w}_T\|} \geq \sqrt{T} \cdot constant$

证明：由于