a) The margin is $\tilde{\gamma} = \frac{2c}{\|w\|}$

$$\Leftrightarrow \frac{\tilde{\gamma}}{c} = \frac{2}{\|w\|}$$

Therefore: c only scales up / down the margin, it do not effect the bounding plane.

b) optimization problem for SVM

$$\min_{w,b} \|w\|^2$$

$$\text{st} \quad y^i(w^T x^i + b) \geq 1 \quad \forall i$$

Lagrangian function:

$$\mathcal{L}(w, a, b) = \frac{1}{2} w^T w + \sum_{i=1}^{m} \alpha_i \left(1 - y^i (w^T x^i + b)\right)$$

$$\frac{\partial \mathcal{L}}{\partial w} = w - \sum_{i=1}^{m} \alpha_i y^i x^i = 0$$

$$\Leftrightarrow \quad w = \sum_{i=1}^{m} \alpha_i y^i x^i$$

$$\frac{\partial \mathcal{L}}{\partial b} = \sum_{i=1}^{m} \alpha_i y^i = 0$$

① w is the weighted sum of (α_i) of ($y^i x^i$) with label and feature

the weight α_i is proportional to distance from data point to boarding plane