Q1 (a) In the class we showed that the margin is $\frac{2c}{\|w\|}$ and we want to maximize this margin.

The magnitude of c is merely scales w and b in below

$$\max \frac{2c}{\|w\|} \quad s.t.\ y^i(w^T x^i + b) \geq c \ \forall i$$

and because c is constant we need to find the optimum value for $\frac{2c}{\|w\|}$, we can omit c and "2".

hence we can find the statement can be replaced by

$$\frac{1}{\|w\|} \quad s.t.\ y^i(w^T x^i + b) \geq 1 \ \forall i$$

Q1 (b) the lagrangian dual problem is

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

$$\frac{\partial L(w,a,b)}{\partial w} = w + 0 - \sum_{i=1}^{m} a_i y^i x^i + 0 = 0$$

$$= w - \sum_{i=1}^{m} a_i y^i x^i = 0 \Rightarrow \boxed{w = \sum_{i=1}^{m} a_i y^i x^i}$$

in the HW Question $n = m$ & $y^i = y_i$ & $x^i = x_i$.