Q1 b) $\frac{\partial L}{\partial w} = \frac{\partial H_\delta(y-t)}{\partial w}$

$= \frac{\partial}{\partial w} H'(y-t).$

$= \frac{\partial}{\partial w} H'(w^T x + b - t).$

$= \frac{\partial(y-t)}{\partial w} \cdot H'(x^T w + b - t).$

$H'_\delta(a) = \begin{cases} a & \text{if } |a| \leq \delta \\ \delta & \text{if } |a| > \delta, \end{cases}$

$H'_\delta(y-t) = \begin{cases} w^T x + b - t & \text{if } |a| \leq \delta \\ \delta & \text{if } |a| > \delta \end{cases}$

$\frac{\partial L}{\partial w} = x^T H'_\delta(y-t).$

$\frac{\partial L}{\partial b} = \frac{\partial(y-t)}{\partial b} \cdot H'(y-t).$

$= H'(y-t).$

Q2 a)

$$L(w) = \frac{1}{2}(y - Xw)^T A (y - Xw) + \frac{\lambda}{2}\|w\|^2$$

$$w^* = \arg\min L(w).$$

$$L(w) = \frac{1}{2}(y^T - w^T A^T) A (y - Xw) + \frac{\lambda}{2}\|w\|^2.$$

$$= \frac{1}{2}(y^T A y - 2w^T X^T A y + w^T X A X w) + \frac{\lambda}{2}\|w\|^2$$

$$\frac{\partial L(w)}{\partial w} = X^T A y + X^T A X w + \lambda w \qquad \text{note: } y = \|w\|^2$$

$$= 0.$$

then

$$(X^T A X + \lambda I) w = X^T A y$$

$$w^* = (X^T A X + \lambda I)^{-1} X^T A y.$$