Q3:

$$\frac{\partial}{\partial b}\mathcal{L}\left(\underline{\mathbf{w}},b\right)\overset{a}{=}\frac{\partial}{\partial b}\frac{1}{m}\sum_{i=1}^{m}\left(\underline{w}^{\top}\underline{x}_i+b-y_i\right)^2\overset{b}{=}\frac{1}{m}\frac{\partial}{\partial b}\sum_{i=1}^{m}\left(\underline{w}^{\top}\underline{x}_i+b-y_i\right)^2\overset{c}{=}\frac{1}{m}\sum_{i=1}^{m}\frac{\partial}{\partial b}\left(\underline{w}^{\top}\underline{x}_i+b-y_i\right)^2\overset{d}{=}$$

$$\overset{d}{=}\frac{1}{m}\sum_{i=1}^{m}2\left(\underline{w}^{\top}\underline{x}_i+b-y_i\right)\cdot(1)\overset{e}{=}\frac{2}{m}\sum_{i=1}^{m}\left(\underline{w}^{\top}\underline{x}_i+b-y_i\right)\overset{f}{=}\frac{2}{m}\left[mb+\sum_{i=1}^{m}\left(\underline{w}^{\top}\underline{x}_i-y_i\right)\right]\overset{g}{=}$$

$$\overset{g}{=}2b+\frac{2}{m}\sum_{i=1}^{m}\left(\underline{w}^{\top}\underline{x}_i-y_i\right)\Rightarrow\frac{\partial}{\partial b}\mathcal{L}\left(\underline{\mathbf{w}},b\right)=2b+\frac{2}{m}\sum_{i=1}^{m}\left(\underline{w}^{\top}\underline{x}_i-y_i\right)$$

a : Definition of $\mathcal{L}\left(\underline{\mathbf{w}},b\right)$
b : $\frac{1}{m}$ is scalar
c : Derivative of a sum is the sum of derivatives
d : Derivative of $\left(\underline{w}^{\top}\underline{x}_i-b-y_i\right)^2$w.r.t b
e : 2 is scalar
f : Sum of b
g : Removing b from the sum