Q2:

$$S = \sum (Y - \hat{Y})^2$$
$$S = \sum (Y - \theta_1 - \theta_2 \frac{X}{e^X})^2$$

$$(q1) = \frac{\partial S}{\partial \theta_1} = \sum (2\theta_1 - 2Y + 2X\theta_2 e^{-X})$$
$$= -2 \sum (Y - \theta_1 - \theta_2 \frac{X}{e^X})$$
$$= -2 \sum (Y - \hat{Y})$$

$$(q2) = \frac{\partial S}{\partial \theta_2} = \sum \frac{1}{e^{2X}} (2X^2\theta_2 + 2X\theta_1 e^X - 2XYe^X)$$
$$= -2 \sum (Y - \hat{Y})(X/e^X)$$

$$(h11) = \frac{\partial}{\partial \theta_1} \sum (2\theta_1 - 2Y + 2X\theta_2 e^{-X}) = 2n$$

$$(h22) = \frac{\partial}{\partial \theta_2} \sum \frac{1}{e^{2X}} (2X^2\theta_2 + 2X\theta_1 e^X - 2XYe^X)$$
$$= 2 \sum X^2 e^{-2X}$$

$$(h12) = \frac{\partial}{\partial \theta_2} \sum (2\theta_1 - 2Y + 2X\theta_2 e^{-X})$$
$$= 2 \sum X e^{-X}$$

$$(h21) = \frac{\partial}{\partial \theta_1} \sum \frac{1}{e^{2X}} (2X^2\theta_2 + 2X\theta_1 e^X - 2XYe^X)$$
$$= 2 \sum X e^{-X}$$