(c) Training Set: $\{(x^{(i)}, y^{(i)})\}_{i=1}^{m}$

$$p(y^{(i)} | x^{(i)}; \theta) = \frac{1}{y!} \exp\left((\theta^T x^{(i)}) y^{(i)} - e^{\theta^T x^{(i)}}\right)$$

$$l_i(\theta) = \log\left(p(y^{(i)} | x^{(i)}; \theta)\right)$$

$$= \log\left(\frac{1}{y!}\right) + (\theta^T x^{(i)}) y^{(i)} - e^{\theta^T x^{(i)}}$$

$$\nabla_\theta l_i(\theta) = (x^{(i)}) y^{(i)} - e^{\theta^T x^{(i)}} x^{(i)}$$

$$= \left(y^{(i)} - e^{\theta^T x^{(i)}}\right) x^{(i)}$$

$$\Rightarrow \quad \theta := \theta + \alpha \nabla_\theta l_i(\theta)$$

$$\Rightarrow \quad \boxed{\theta := \theta + \alpha \left(y^{(i)} - e^{\theta^T x^{(i)}}\right) x^{(i)}}$$