answer log likelihood $\ell(\theta) = logp(y^i \mid x^i; \theta) \partial \ell(\theta) \partial \theta_j = \partial logp(y^i \mid x^i; \theta) \partial \theta_j using Exponential family = \partial log(b(y) exp(\eta^T T(y) - a(\eta) \partial \theta_j substituting for poisson = \partial log(1 y^! exp(\eta^T y - e^\eta) \partial \theta_j Substitute eta and separate terms = \partial log(exp((\theta^T x)^T y - e^{\theta^T x}) \partial \theta_j + \partial log(1 y^!) \partial \theta_j cancel term and cancel log and exp = \partial((\theta^T x)^T y - e^{\theta^T x}) \partial \theta_j = \partial((\Sigma \theta_i x_i) y - e^{\theta^T}$
$\partial((\theta^T x_j)^T y - e^{\theta^T x}) \partial \theta_j \partial \ell(\theta) \partial \theta_j = (y - e^{\theta^T x}) x_j The stochastic gradient ascent takes the form \theta_j := \theta_j + \alpha(y - e^{\theta^T x}) x_j$