answer The sum of probabilities for y given x is 1 eqnarray* $\int p(y \mid x;\theta)dy = 1 Substituting for exponential family \int b($
$a(\eta))dy = 1 arranging equation \int b(y)\exp(\eta^T y)dy = exp(a(\eta)) taking derivative w.r.teta \partial a(\eta\partial\eta \int b(y)\exp(\eta^T y)dy =$
$\partial a(\eta\partial\eta exp(a(\eta)) \int yb(y)\exp(\eta^T y)dy = \partial a(\eta\partial\eta exp(a(\eta)) Rearranging eq form \partial a(\eta\partial\eta = \int yb(y)\exp(\eta^T y -$
$a(\eta))dy = 1 additional term y * exp family probability form = \int yp(y \mid x;\theta)dy \partial a(\eta\partial\eta = E[y \mid x : \theta]$