✱ logistic regression의 loss function과 softmax regression의 loss function은 본질적으로 동일

i) logistic regression

$$a_1 = g(z) = \frac{1}{1+e^{-z}} = P(y=1 \mid \vec{z})$$

$$(z = \vec{w} \cdot \vec{x} + b)$$

$$a_2 = 1 - a_1 \quad = P(y=0 \mid \vec{z})$$

$$loss = -y \log a_1 - (1-y) \log \underset{a_2}{(1-a_1)} = -(y \log a_1 + (1-y) \log a_2)$$

ii) softmax regression

$$a_j = \frac{e^{z_j}}{\sum_{k=1}^{N} e^{z_k}} = P(y=j \mid \vec{z})$$

$$loss = -\sum_{j=1}^{k} y_j \log(a_j)$$

만약 softmax regression problem에서 분류해야할 class수가 2개라면?

$$\Rightarrow k=2$$

$$loss = -y_1 \log a_1 - y_2 \log a_2 = -(y \log a_1 + (1-y) \log a_2)$$

동일