Q3-1: Select the correct option.

A. *For logistic regression, sometimes gradient descent will converge to a local minimum (and fail to find the global minimum).*

B. *The cost function for logistic regression trained with 1 or more examples is always greater than or equal to zero.*

1. Both statements are true.
2. Both statements are false.
3. Statement A is true, Statement B is false.
4. Statement B is true, Statement A is false.

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A. *For logistic regression, sometimes gradient descent will converge to a local minimum (and fail to find the global minimum).*

B. *The cost function for logistic regression trained with 1 or more examples is always greater than or equal to zero.*

The cost function for logistic regression is convex, so gradient descent will always converge to the global minimum.

1. Both statements are true.
2. Both statements are false.
3. Statement A is true, Statement B is false.
4. Statement B is true, Statement A is false. ←

The cost for any example is always >= 0 since it is the negative log of a quantity less than one. The cost function is a summation over the cost for each sample, so the cost function itself must be greater than or equal to zero.

Q3-1: Please calculate the softmax of (1, 2, 3, 4, 5).

1. (0.067, 0.133, 0.2, 0.267, 0.333)
2. (0, 0.145, 0.229, 0.290, 0.336)
3. (0.012, 0.032, 0.086, 0.234, 0.636)
4. (0.636, 0.234, 0.086, 0.032, 0.012)

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By the lecture, we have for some $a = (a_i)$,

$$softmax(a)_i = \frac{\exp(a_i)}{\sum_j \exp(a_j)}.$$

Here:

(A) $\frac{a_i}{\sum_j a_j}$

(B) $\frac{\log(a_i)}{\sum_j \log(a_j)}$

(C) $\frac{\exp(a_i)}{\sum_j \exp(a_j)}$

(D) $\frac{\exp(-a_i)}{\sum_j \exp(-a_j)}$