Q1-1: Which of the following statement is true about Linear regression?

(A) After adding ℓ_2 regularization, we don't have closed form solutions for linear regression
(B) Adding ℓ_1 regularization can encourage sparsity in the found solution

1. True, True
2. True, Fasle
3. False, True
4. False, False

Q1-1: Which of the following statement is true about Linear regression?

(A) After adding ℓ_2 regularization, we don't have closed form solutions for linear regression
(B) Adding ℓ_1 regularization can encourage sparsity in the found solution

1. True, True
2. True, Fasle
3. False, True ←
4. False, False

We still have a closed form solution $w = (X^T X + \lambda I)^{-1} X^T y$ for ridge regression adding ℓ_2 regularization. Adding ℓ_1 regularization is lasso which encourages sparsity.

Q1-2: Suppose you find that your linear regression model is under fitting the data. In such situation which of the following options would you consider?

A. *Add more variables*
B. *Start introducing polynomial degree variables*
C. *Use L1 regularization*
D. *Use L2 regularization*

1. A, B, C
2. A, B, D
3. A, B
4. A, B, C, D

Q1-2: Suppose you find that your linear regression model is under fitting the data. In such situation which of the following options would you consider?

A. *Add more variables*

B. *Start introducing polynomial degree variables*

C. *Use L1 regularization*

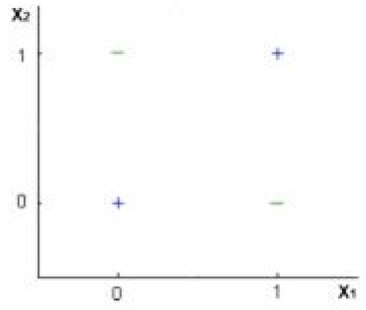
D. *Use L2 regularization*

1. A, B, C
2. A, B, D
3. A, B
4. A, B, C, D

In case of under fitting, you need to induce more variables in variable space or you can add some polynomial degree variables to make the model more complex to be able to fit the data better. No regularization methods should be used because regularization is used in case of overfitting.

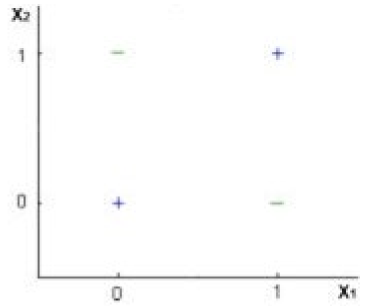
Q2-1: Can a Logistic Regression classifier do a perfect classification on the data shown below?

1. Yes
2. No
3. Can't say
4. None of these



Q2-1: Can a Logistic Regression classifier do a perfect classification on the data shown below?

1. Yes
2. No
3. Can't say
4. None of these



No, logistic regression only forms linear decision surface, but the examples in the figure are not linearly separable.

Q2-2: Let $\sigma(a) = ⅓$. Using the properties of sigmoid function, calculate the value of the expression: $\boldsymbol{\sigma'(-a)}$, where ‘ represents derivative.

1. 2/9
2. -2/9
3. 1/9
4. -1/9

Q2-2: Let $\sigma(a) = ⅓$. Using the properties of sigmoid function, calculate the value of the expression: $\boldsymbol{\sigma'(-a)}$, where ‘ represents derivative.

1. 2/9
2. -2/9
3. 1/9
4. -1/9

$\sigma'(-a) = \sigma(-a)(1 - \sigma(-a)) = (1 - \sigma(a))(1 - (1 - \sigma(a)))$
$= (1 - \sigma(a))\sigma(a) = 2/9$

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.

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. ←

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

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.

Q3-2: Which of the following statement is true about outliers in Linear regression?

1. Linear regression is sensitive to outliers
2. Linear regression is NOT sensitive to outliers
3. Can’t say
4. None of these

Q3-2: Which of the following statement is true about outliers in Linear regression?

1. Linear regression is sensitive to outliers
2. Linear regression is NOT sensitive to outliers
3. Can't say
4. None of these

The solution of the regression line will change due to outliers in most of the cases. In general, sum of squared errors is sensitive to outliers. So Linear Regression is sensitive to outliers.