Assignment 1: Regression

Author: Danis Alukaev
Email: d.alukaev@innopolis.university

2.2 Theoretical Question On Ridge Regression

1. Rule (A)
The line has a large slope θ. Consequently, such a rule results in a high error. However, by the problem statement rule is obtained by minimization of loss function. Therefore, the line cannot be found in current settings.
Answer: Neither.

2. Rule (B)
The increasing of lambda value leads to decreasing of slope θ. The line has a high slope θ. Therefore, the loss function has low lambda value.
Answer: Low.

3. Rule (C)
The decreasing of lambda value leads to increasing of slope theta. The line has a small slope θ. Therefore, the loss function has high lambda value.
Answer: High.

4. Rule (D)
The line has a suitable slope, but insufficient intercept θ_0. This parameter can be increased resulting in lower loss function, but the regularization term will stay unchanged. However, by the problem statement rule is obtained by minimization of loss function. Therefore, the line cannot be found in current settings.
Answer: Neither.

3.2 On Regularization in Logistic Regression

The equation for the line separating classes is $\theta_0 + \theta_1 x_1 + \theta_2 x_2 = 0$. Taking into account large C that penalize θ_2 and absence of θ_0 the equation becomes $x_2 = -\theta_3 x_1, \theta_3 \to \infty$,. This means that the potential boundary should be close to x_2-axis.
Considering boundary $L2$ we can find that for the large C the logistic regression will not converge to this line, because the regularization term will prevail on the

logistic function.
Considering boundary $L4$ we can find that the rule will have large error and thus cannot be obtained after minimization of loss function.
Considering boundary $L3$ we can find that it has tolerable error. Also, for the large enough C the decision boundary will approach the x_2-axis that is the case for $L3$ boundary.

Answer: decision boundary $L3$.