Quiz 1: Data science
Total Marks: 10   2018-02-23

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Question 1: [1 + 1.5 marks] Suppose m = 4 students have taken some machine learning course, and the course had a midterm exam and a final exam. You have collected a dataset of their scores on the two exams, which is as follows:

(midterm exam)^2	midterm exam	final exam
7921	89	96
5184	72	74
8836	94	87
4761	69	78

You would like to use polynomial regression to predict a student's final exam score from their midterm

exam score. Concretely, suppose you want to fit a model of the form $h_\theta(x) = \theta_0 + \theta_1 x_1 + \theta_2 x_2$, where x_1 is midterm score and x_2 is (midterm exam)^2.

   a) What will be the problem if we don't normalize features? Draw a figure (contour plot) to illustrate your answer.

   b) What are normalized features $x_1^{(2)}$ and $x_1^{(3)}$? (You can use range instead of standard deviation.)

Question 2: (4   marks)   Select the correct options and explain your choice with reasoning.

i)   Suppose you have a dataset with m = 1000 examples and n = 10000 features for each example. You want to use multivariate Linear Regression to fit parameters theta. Should you prefer gradient descent or normal equation? Explain the reason for your choice.

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Answer:

Reason:

ii)   Which of the following statement is true about outliers in Linear regression?

A) Linear regression is sensitive to outliers   B) Linear regression is not sensitive to outliers

C) Can't say   D) None of these

iii)   Does Gradient descent will always converge to same optimal solution if we have a non-convex function? (Yes/No). Explain your choice with reason.
       Reason:

iv)   Which of the following is true about below graphs (A,B, C left to right) between the cost function and Number of iterations?
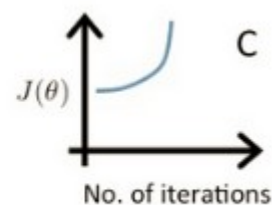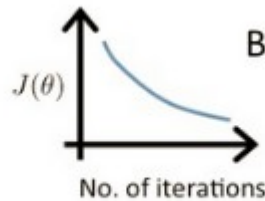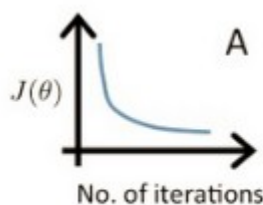
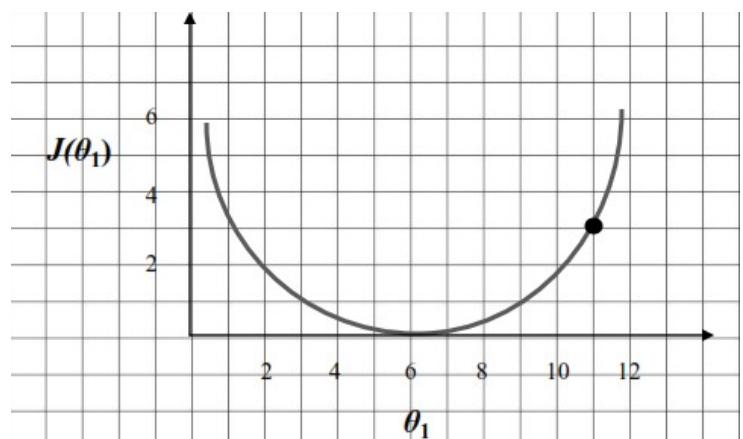   Suppose
l1, l2 and l3 are the three learning rates for A,B,C respectively. Which of the following is true about l1, l2 and l3?

 A) l1 > l2 > l3   B) A) l2 < l1 < l3   C) l1 = l2 = l3   D) It depends on derivative

Reason:

Question 3: [1.5 mark] *Linear Regression :* Assuming linear model for prediction $h_\theta(x) = \theta_0 + \theta_1 X$, (where $\theta_0 = 0$), the cost function curve is shown in the Figure below. Suppose we initialize $\theta_1 = 11,$ where the cost $J(\theta_1) = 3$ (as shown the dot on the curve). What will be the approximately updated value of θ_1 after single iteration of the Gradient Descent Algorithm (assume $\alpha = 2$)?

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