Regularization

1. You are training a classification model with logistic regression. Which of the following statements are true? Check all that apply.

> Adding a new feature to the model always results in equal or better performance on the training set.

- Adding many new features to the model helps prevent overfitting on the training set.
- Introducing regularization to the model always results in equal or better performance on the training set.
- Introducing regularization to the model always results in equal or better performance on examples not in the training set.

2. Suppose you ran logistic regression twice, once with $\lambda = 0$, and once with $\lambda = 1$. One of the times, you got parameters $\theta = \begin{bmatrix} 81.47 \\ 12.69 \end{bmatrix}$, and the other time you got $\theta = \begin{bmatrix} 13.01 \\ 0.91 \end{bmatrix}$. However, you forgot which value of λ corresponds to which value of θ. Which one do you think corresponds to $\lambda = 1$?

> $\theta = \begin{bmatrix} 13.01 \\ 0.91 \end{bmatrix}$

- $\theta = \begin{bmatrix} 81.47 \\ 12.69 \end{bmatrix}$

3. Which of the following statements about regularization are true? Check all that apply.

> Using too large a value of λ can cause your hypothesis to underfit the data.

- Because regularization causes $J(\theta)$ to no longer be convex, gradient descent may not always converge to the global minimum (when $\lambda > 0$, and when using an appropriate learning rate α).
- Using a very large value of λ cannot hurt the performance of your hypothesis; the only reason we do not set λ to be too large is to avoid numerical problems.
- Because logistic regression outputs values $0 \leq h_\theta(x) \leq 1$, its range of output values can only be "shrunk" slightly by regularization anyway, so regularization is generally not helpful for it.

4. In which one of the following figures do you think the hypothesis has overfit the training set?

Figure:

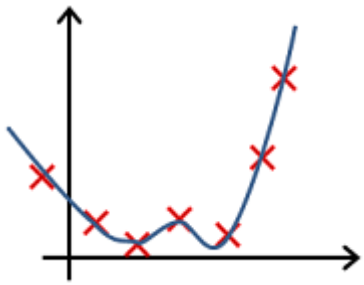
> 

Figure:

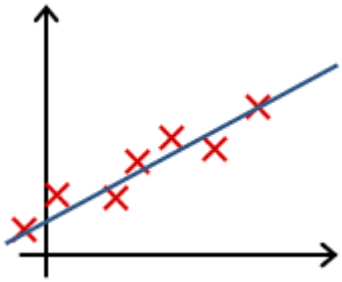
- 

Figure:

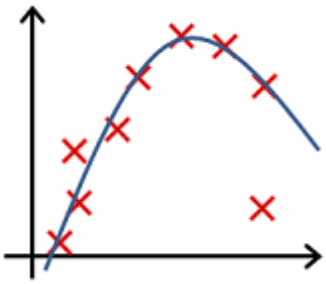
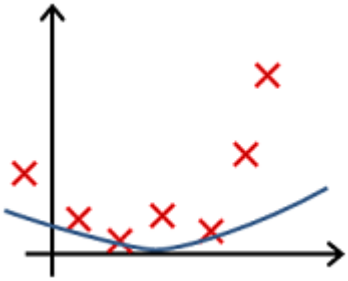
- 

Figure:

- 

5. In which one of the following figures do you think the hypothesis has underfit the training set?

Figure:

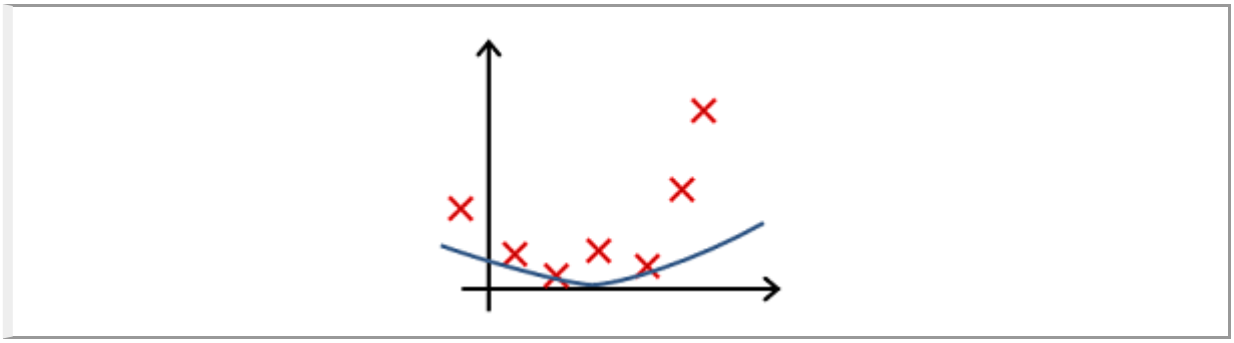
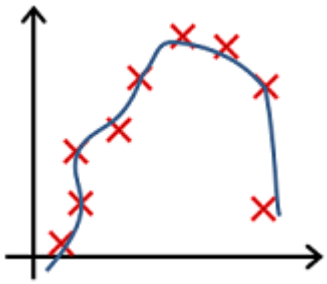


Figure:

- 

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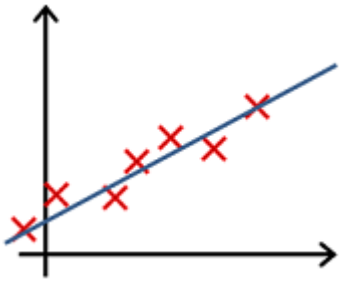

Figure:

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