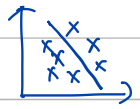
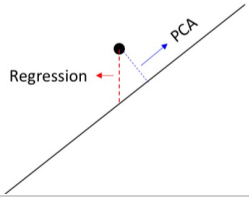
Section 6

1. Yes.



Linear regression aims to find a subspace such that the predicted output and the model output are close. In comparison, PCA wants to find a subspace such that the orthogonal projection of samples onto this subspace is minimised.

2. 

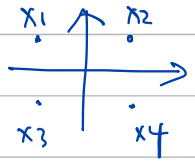
No. Linear regression minimizes $(\hat{y}-y)^2$, while PCA's projection is vertide to the first component

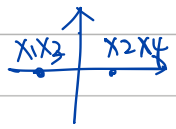
3. The direction will not change. since the data covariance matrix doesn't change, which will generate the same eigenvectors after shifting. i.e. same principle component.

4. No. After PCA, some samples will be overlapped after being projected on its principle components. It will cause the dataset to become non linearly separable.

5. ① Yes, After transformation, the data covariance matrix is same, which will generate results

② No. After transformation, the direction of eigen vectors may be different

6. Suppose the dataset is 

, after PCA, it will be 

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In this case, some data are overlapped, which will harms classifier training.

In higher dimension dataset, it usually overcomplete, and has redundant dimensions which can be optimised by PCA, that benefits further classifier training.