CS 412

APR 7TH – EXAM REVIEW

Review

Midterm, Thursday April 9th, 12-8pm CDT

- Previous exams posted
- Video solutions up tonight

4 questions **(100 points)**

- Short Answer
- SVM
- NN
- Boosting

72hrs

Posted on Piazza, Submit on gradescope

largely worked by hand

One will have a small programming portion

likely for boosting very simple

Short Answer

8 questions

- 5 points per question
- Definitions and qualitiative answers

Open-book

open-not

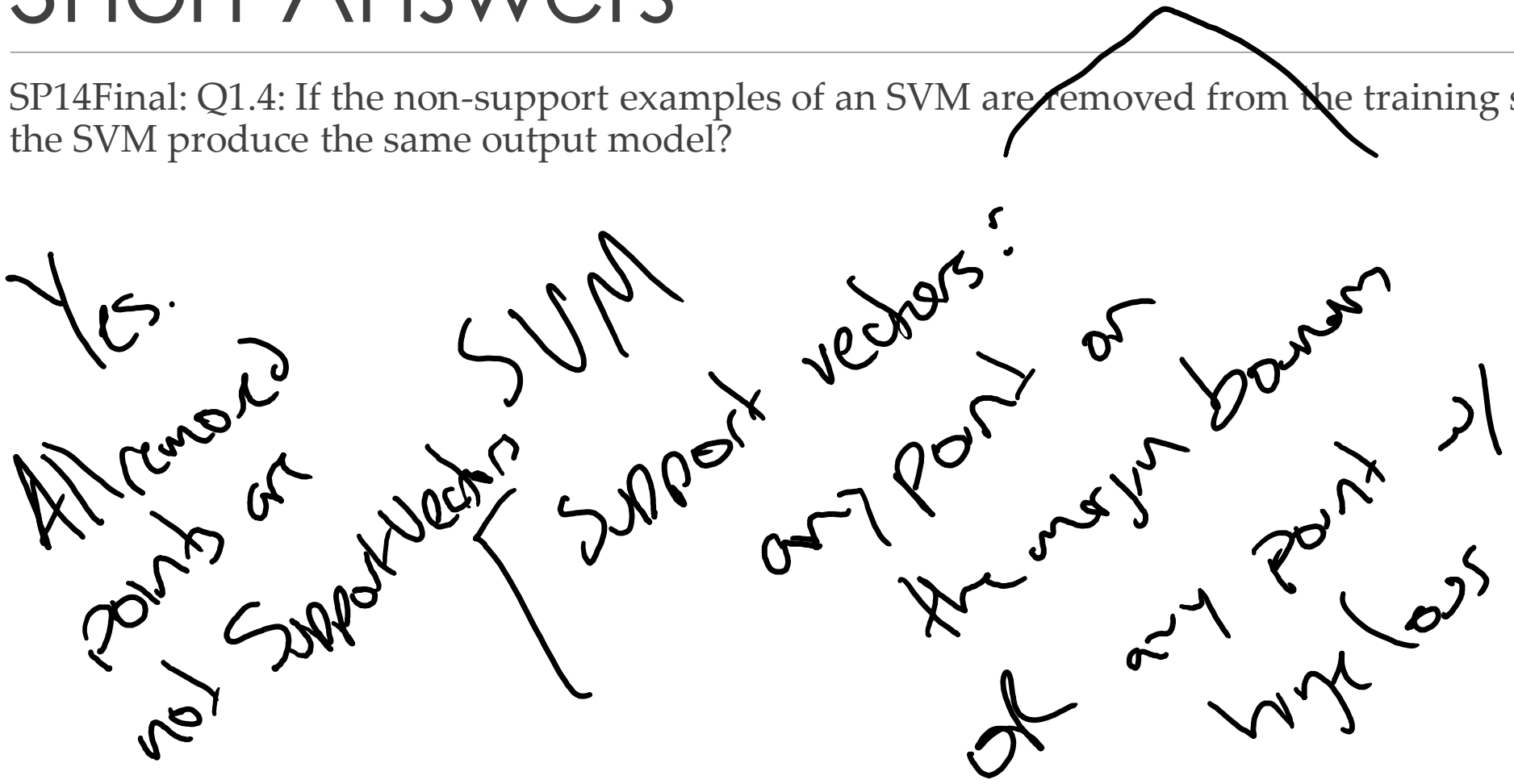
Why might we prefer one model to another

Defend your answer!

bias v. variance

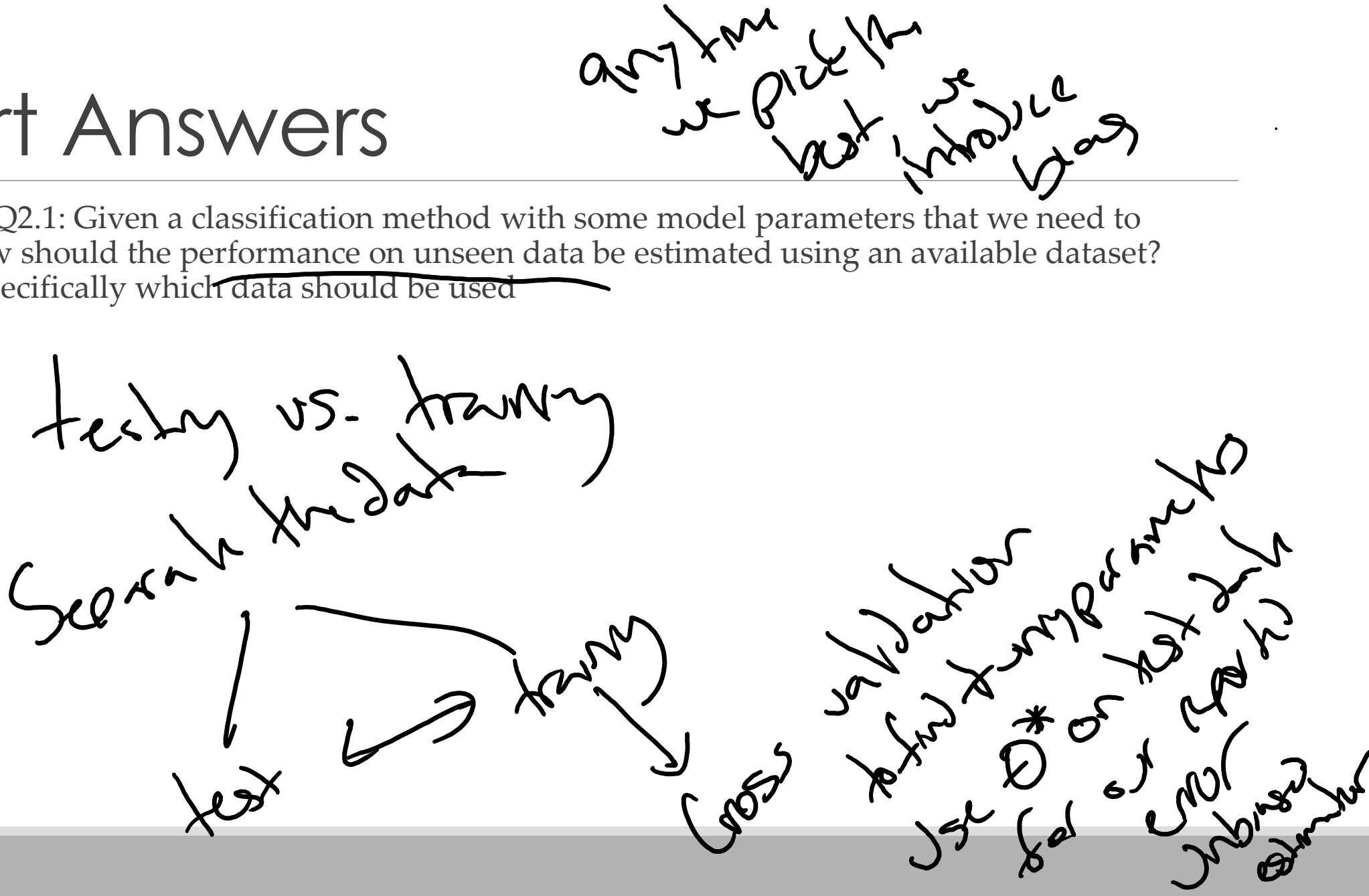
Short Answers

SP14Final: Q1.4: If the non-support examples of an SVM are removed from the training set, will the SVM produce the same output model?



Short Answers

SP14Final: Q2.1: Given a classification method with some model parameters that we need to choose, how should the performance on unseen data be estimated using an available dataset? Describe specifically which data should be used



Short Answers

Documentation lookup

scikit-learn

Give two tuning parameters for each of the following model types:

- Polynomial kernel SVM

degree, C

- Neural Network

nodes, layers

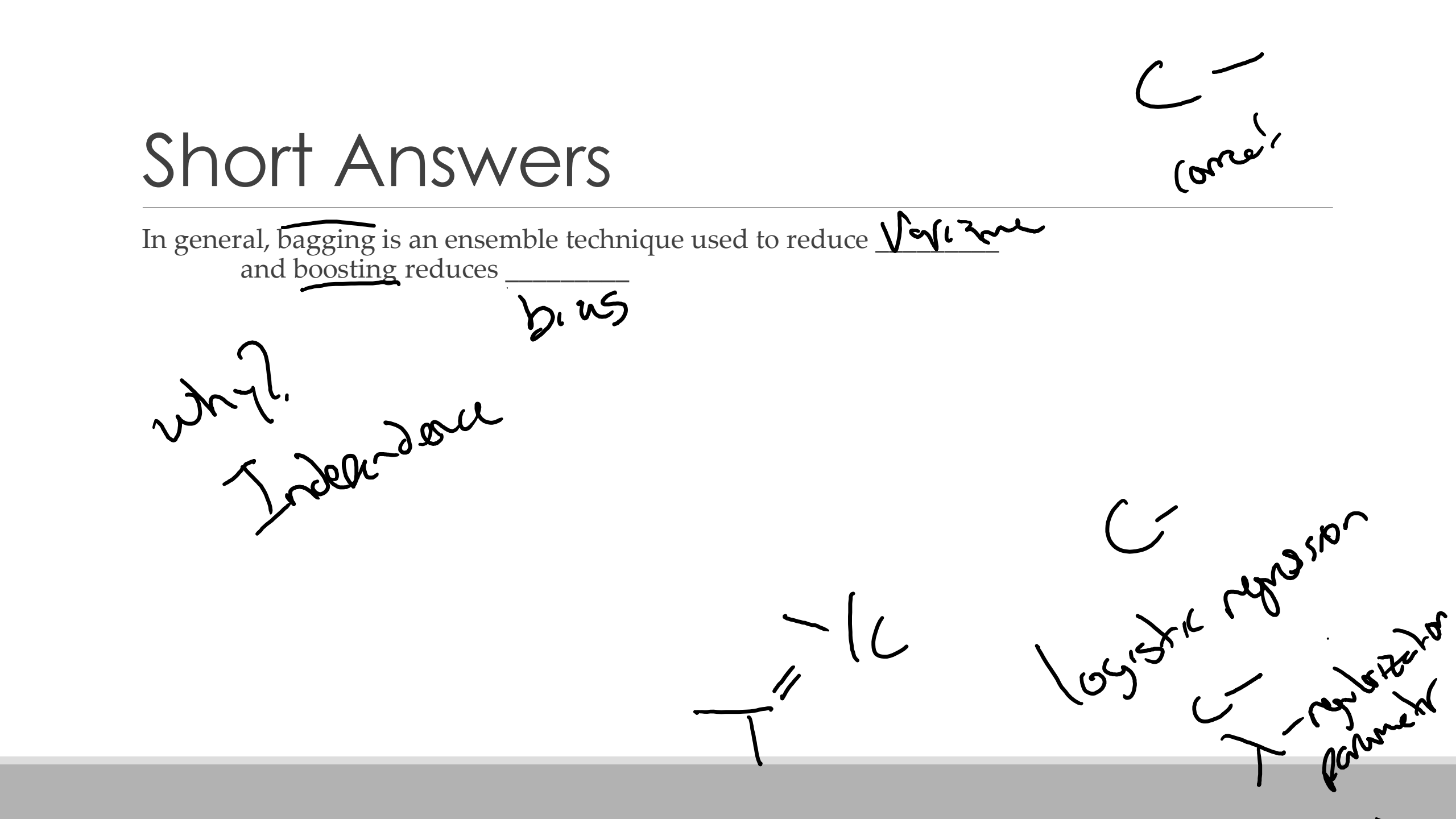
- Nearest Neighbor

K, weights

- Adaboost

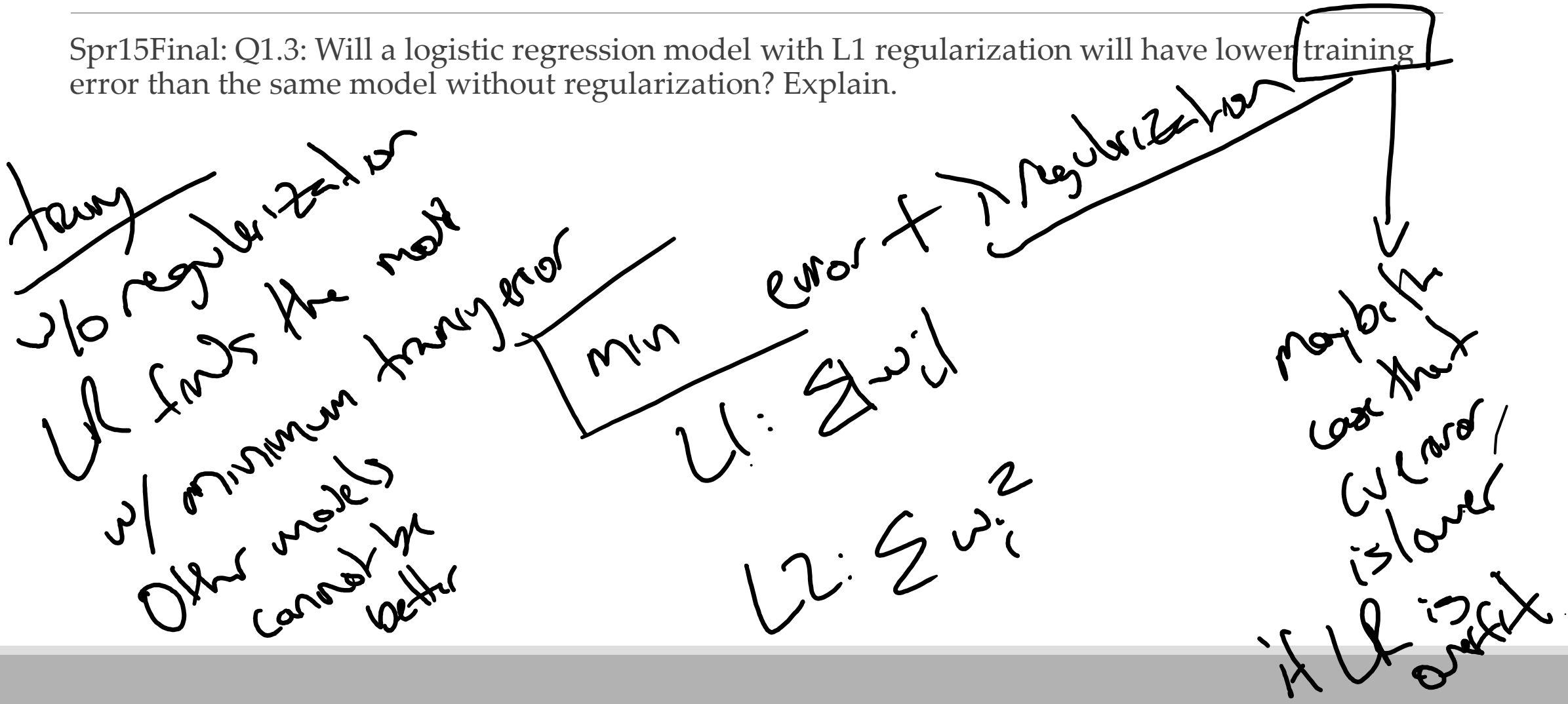
Short Answers

In general, bagging is an ensemble technique used to reduce _____
and boosting reduces _____



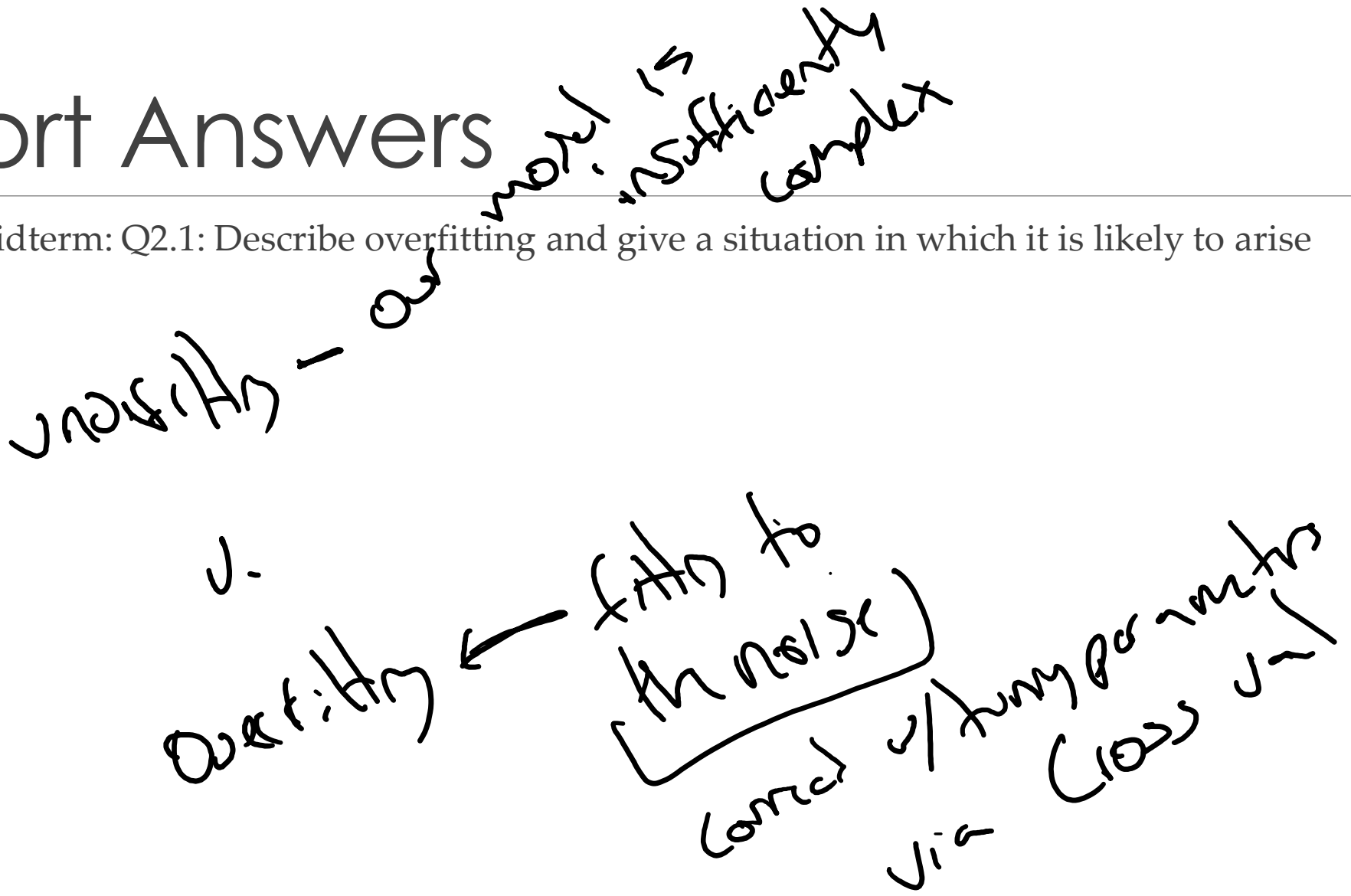
Short Answers

Spr15Final: Q1.3: Will a logistic regression model with L1 regularization will have lower training error than the same model without regularization? Explain.



Short Answers

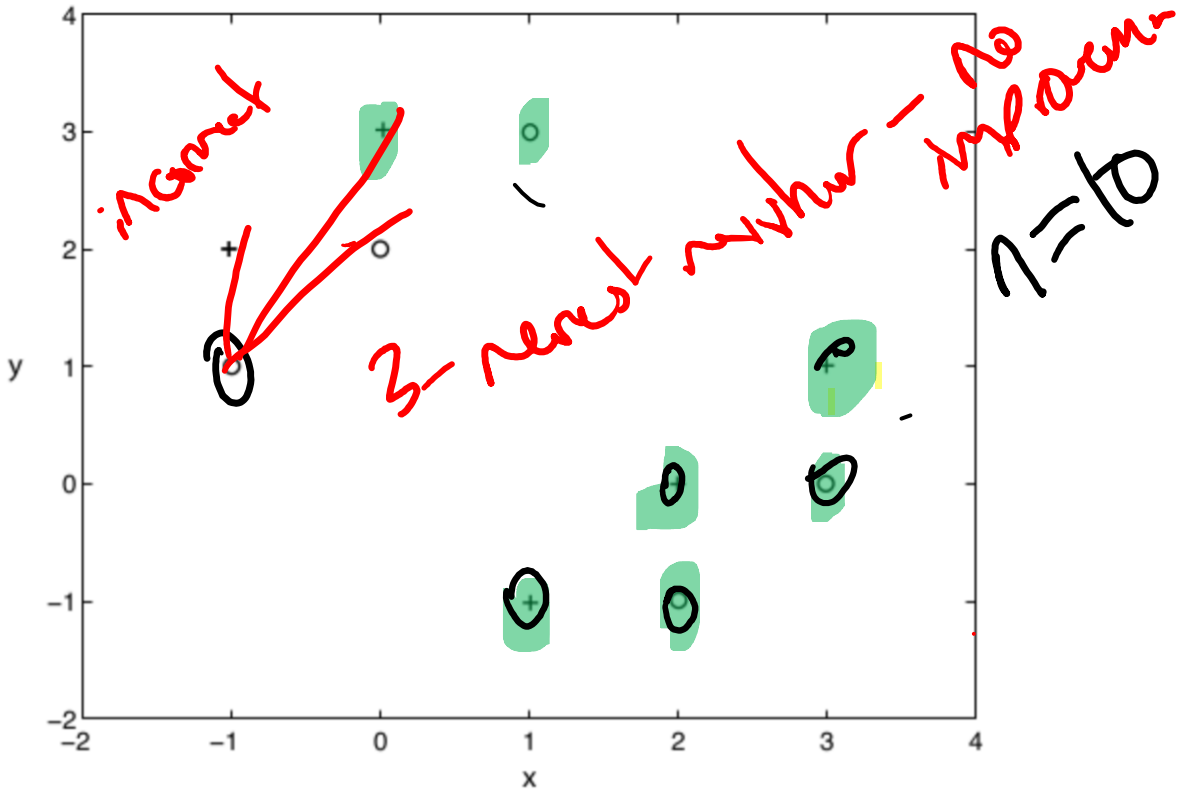
Fall15Midterm: Q2.1: Describe overfitting and give a situation in which it is likely to arise



Short Answers

Spring13Midterm: Q2.: What is the leave-one-out-cross-validation error for the following data set for the 1-Nearest neighbor model?

Which value of k has less error, explain your answer



Boosting

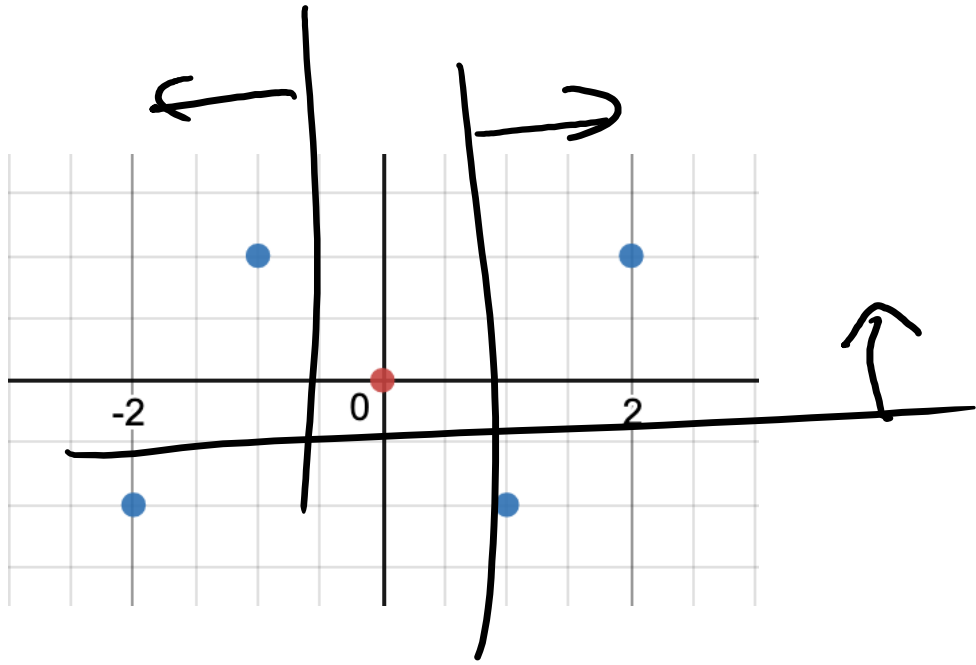
Perform 3 iterations of the boosting algorithm on the following dataset. Double the error at each point and weight each model with $\alpha_i = (1-\varepsilon)/\varepsilon$

Programming

→ Sci-kit learn packages

→ plot simple plot

↳ exactly a plot I've had you do before

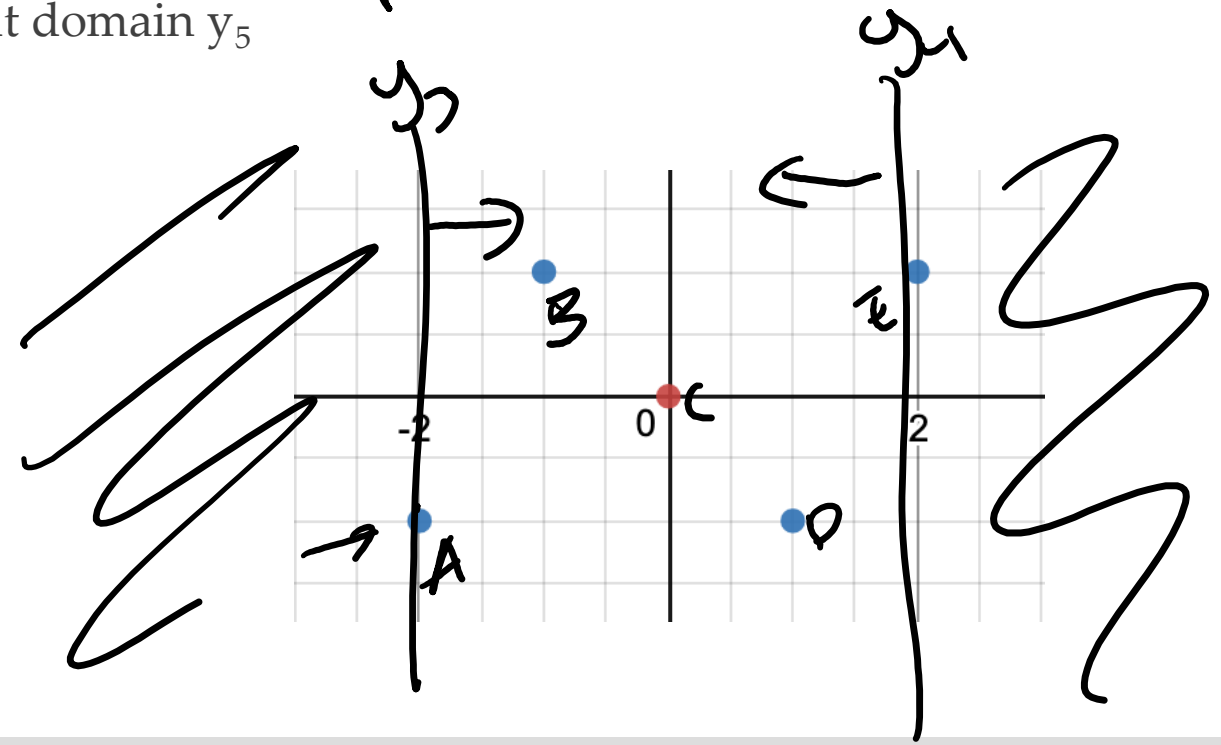


Discussion!

Neural networks

Fit the following data with a neural network with one hidden layer of 2 nodes (y_3,y_4) such that the positive point (red) lies on the decision boundary. Use ReLU as your activation function and let all the weights be in {-1,0,1}

Show your y_3,y_4 plot and your final decider in that domain y_5



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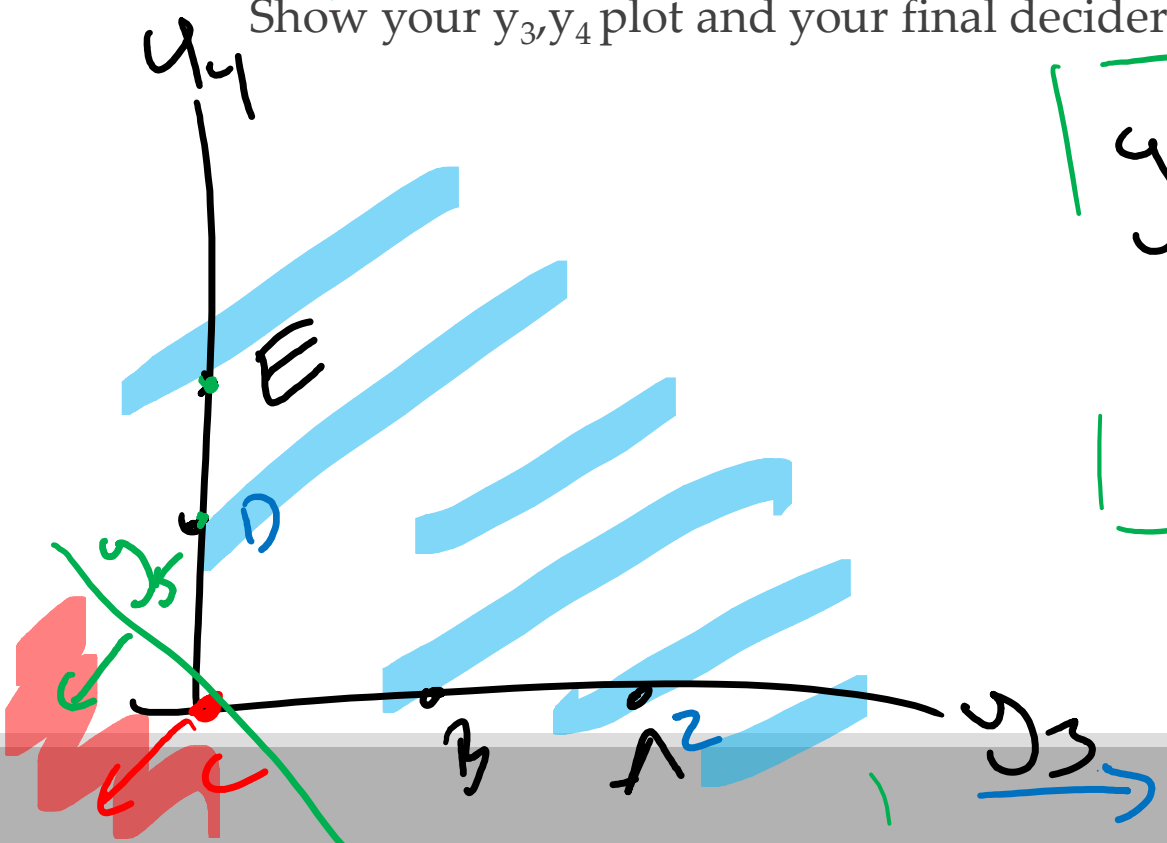
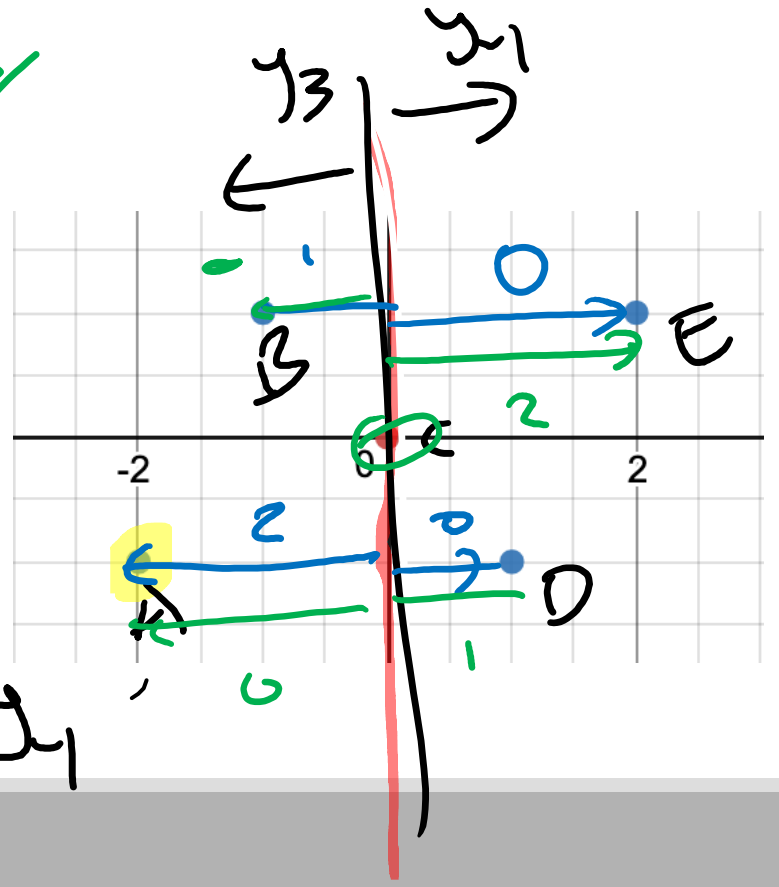


$y_3 = -x_1$

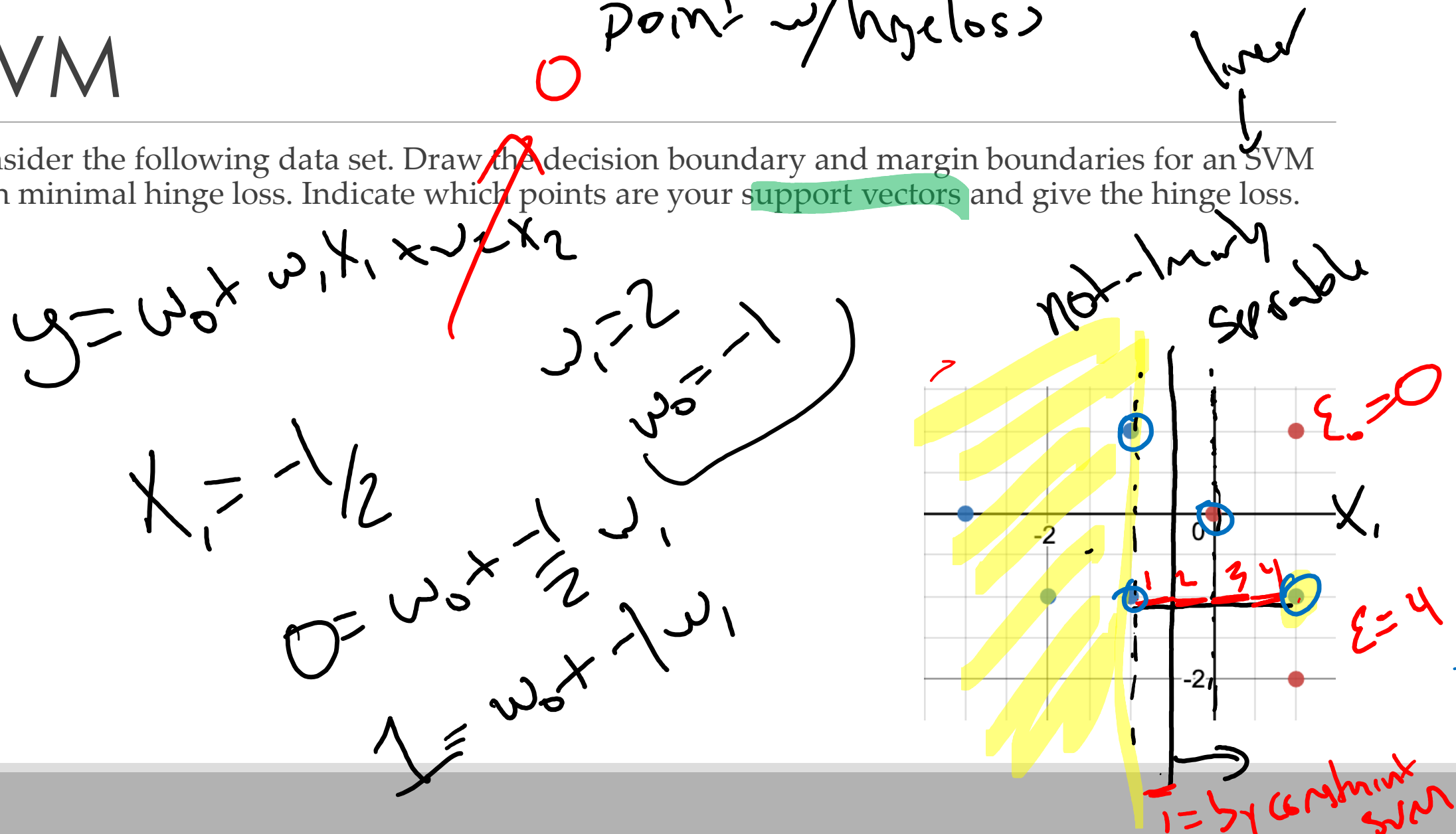
$y_4 = x_1$

$y_5 = -y_3 - y_4$



SVM

Consider the following data set. Draw the decision boundary and margin boundaries for an SVM with minimal hinge loss. Indicate which points are your support vectors and give the hinge loss.



SVM

Consider the following data set. Draw the decision boundary and margin boundaries for an SVM with minimal hinge loss. Indicate which points are your support vectors and give the hinge loss. Let the red points be positive

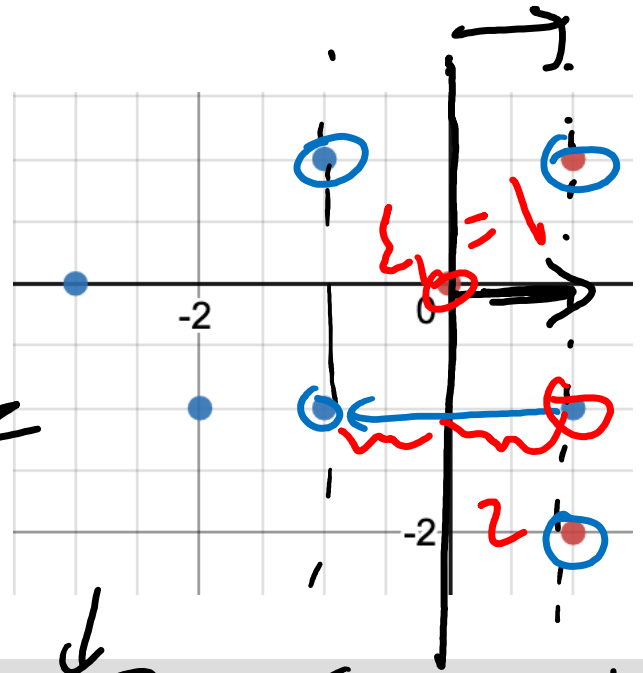
Compare this to the SVM classified as $y = x_1$

What is the decision boundary/region boundary for this SVM?

What are it's support vectors?

What is its hinge loss?

For what values of c might we prefer this model to our original?



Good luck

all work should be your own

Open-book, open-note

Previous exam

Video solution up by tonight

(HW2+3 regrades)

12-8

expects ≤ 2hrs

Project

write up Due on Friday

↳ team members (up to 3)

↳ rough project idea

HW4 out Thursday

Review Quizzes Ensemble