

Assignment 2

Computational Intelligence, SS2020

Team Members		
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1 Linear regression

1.1 Derivation of Regularized Linear Regression

1.2 Linear Regression with polynomial features

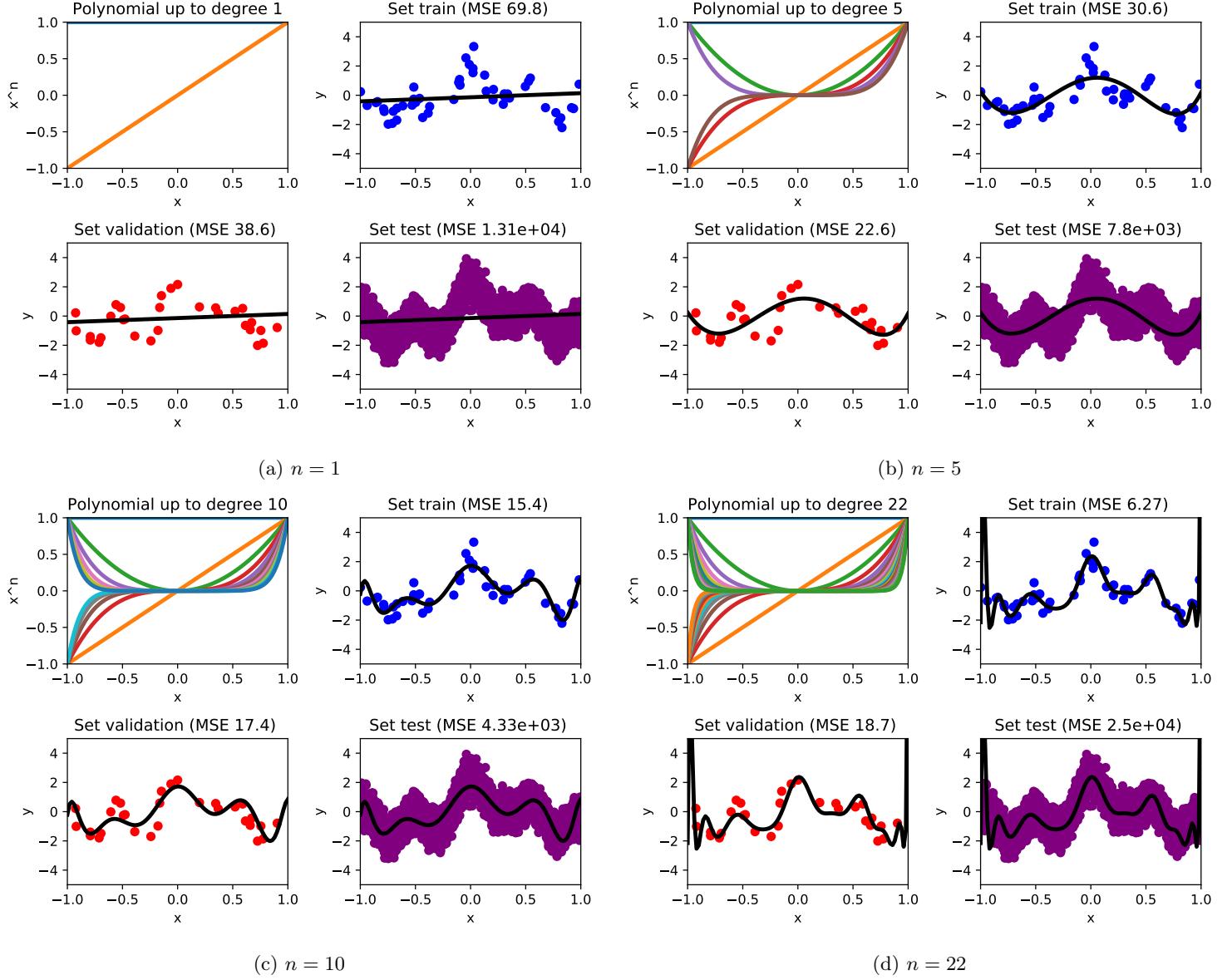


Figure 1: Results of Linear Regression for varying polynomial degree n .

1.3 (Bonus) Linear Regression with radial basis functions

2 Logistic Regression

2.1 Derivation of Gradient

2.2 Logistic Regression training with gradient descent

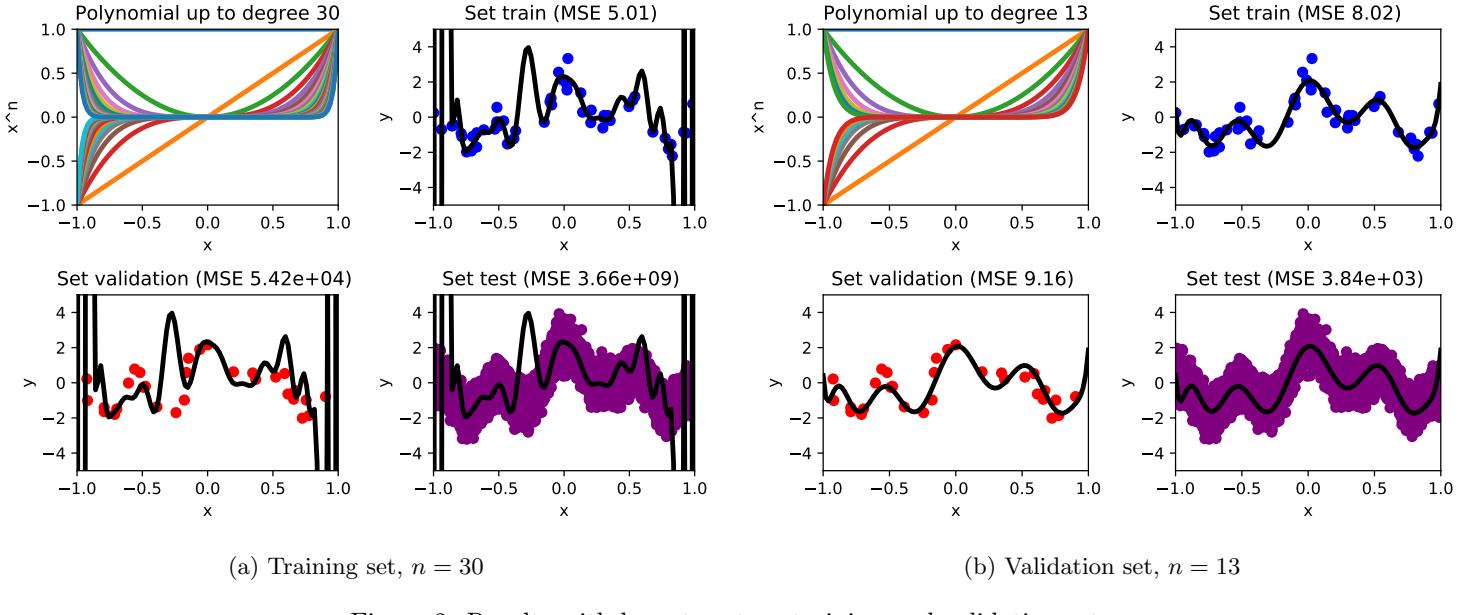


Figure 2: Results with lowest cost on training and validation set.

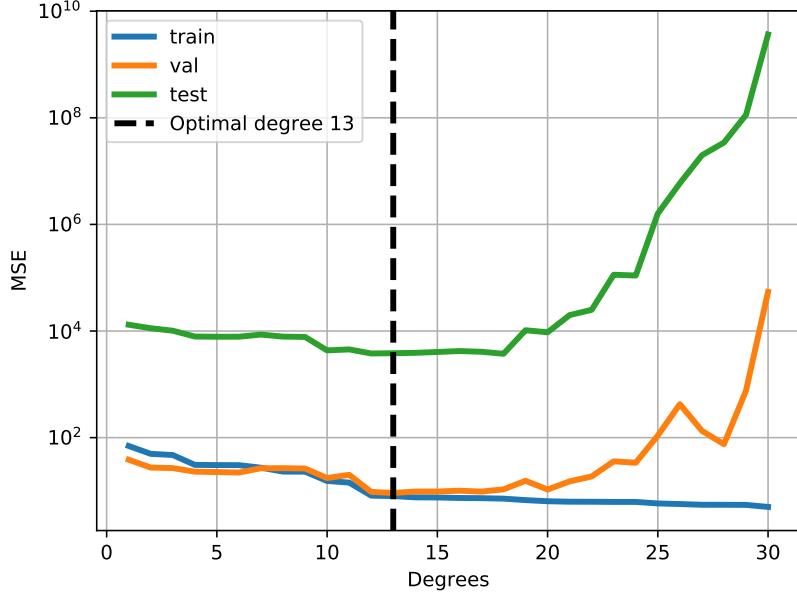


Figure 3: Training, validation and testing costs as a function of the polynomial degree n .

degree l	learning rate η	iterations	training cost	testing cost
1	1	60	0.470	0.391
2	5	75	0.450	0.354
7	10	1000	0.310	0.361
20	8	1500	0.297	0.398

Table 1: Chosen values for learning rate η and number of iterations and obtained training and testing costs for degrees $l = 1, 2, 7, 20$.

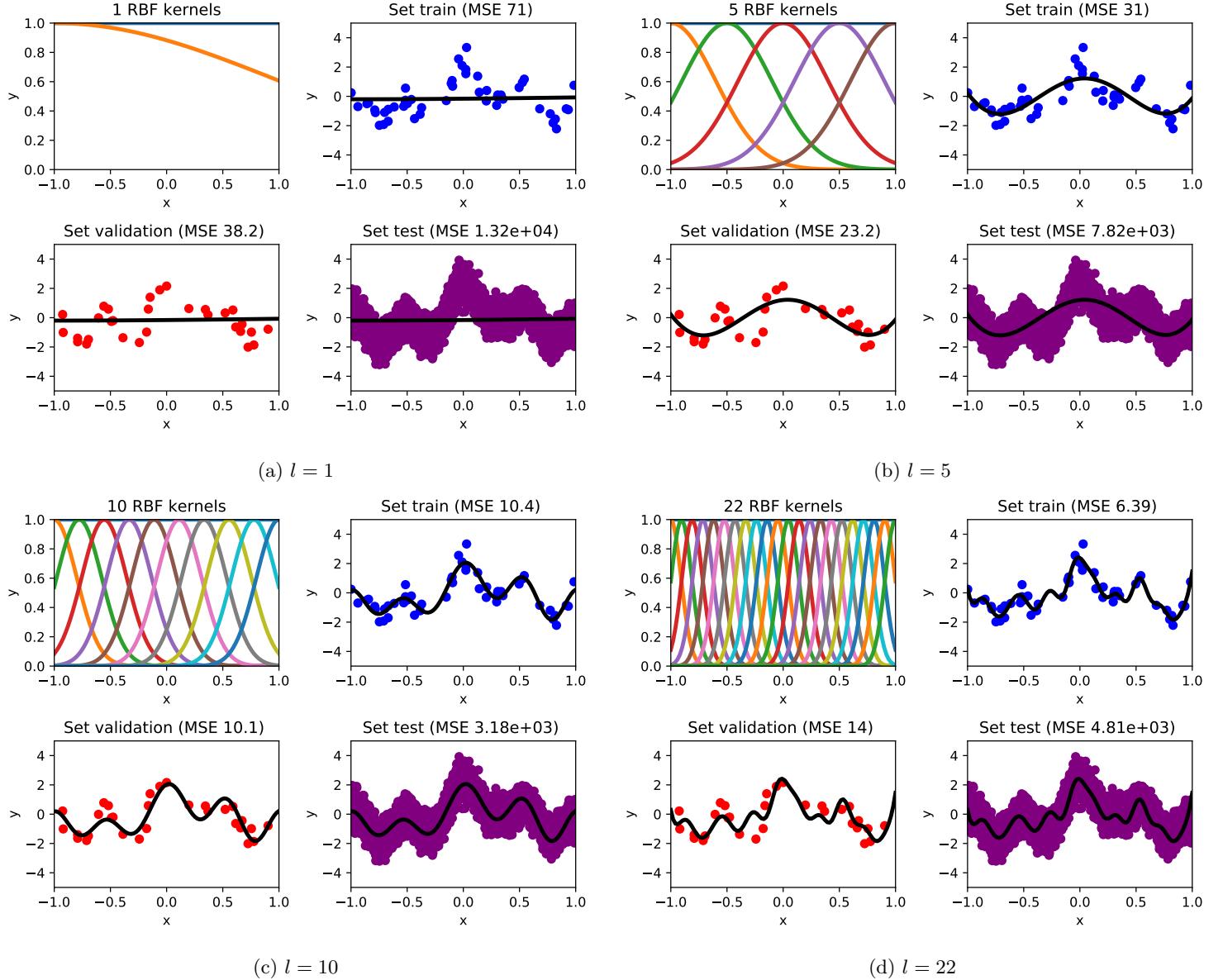


Figure 4: Results of Linear Regression for varying degree l .

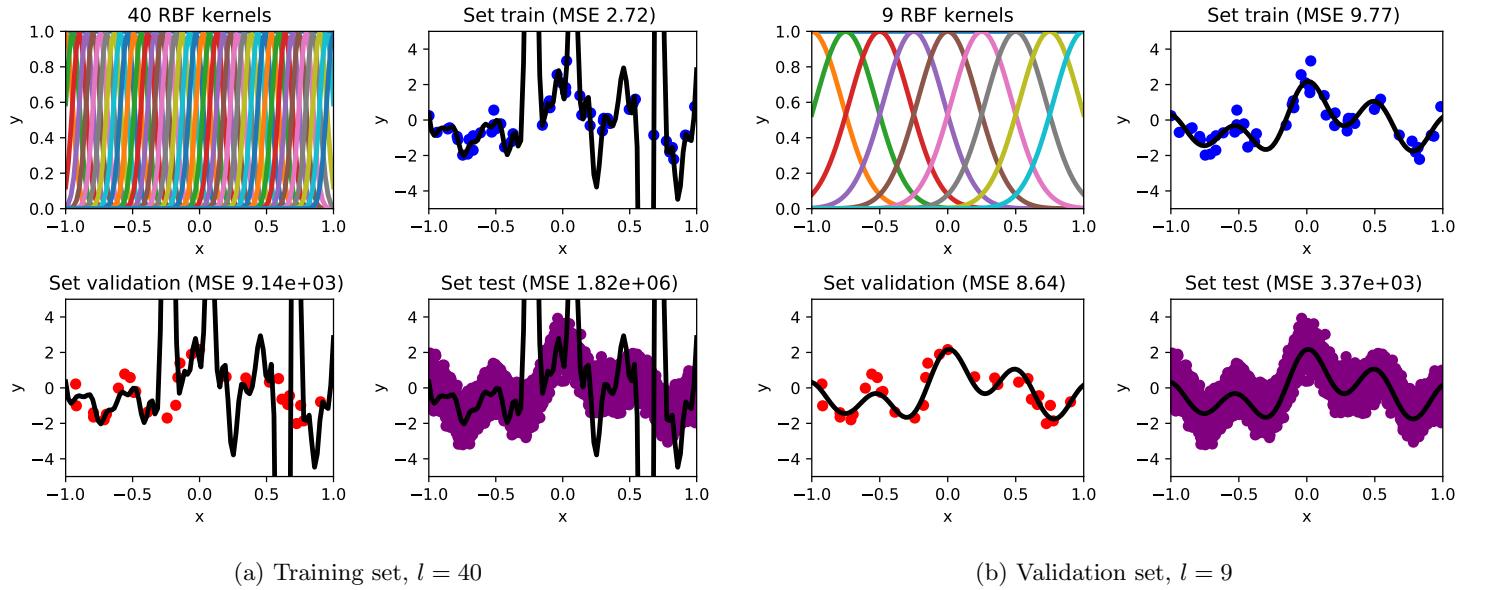
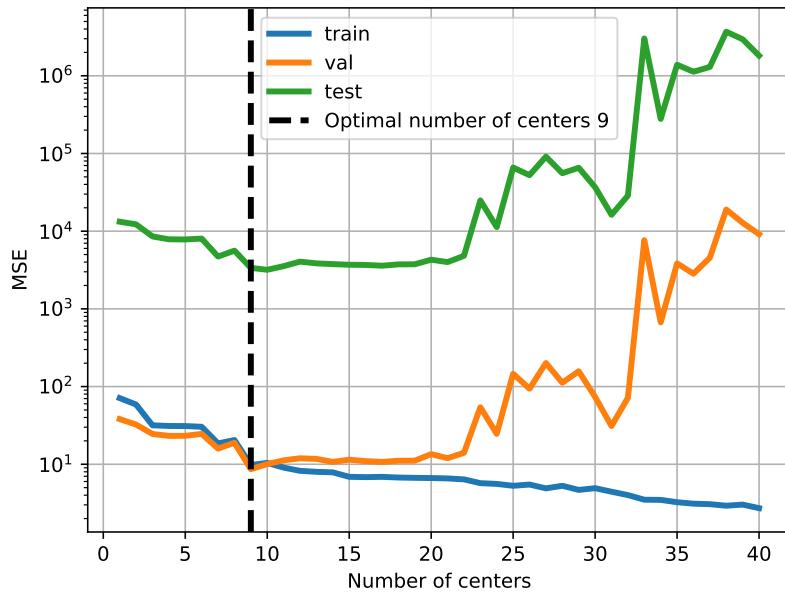
(a) Training set, $l = 40$ (b) Validation set, $l = 9$

Figure 5: Results with lowest cost for training and validation set.

Figure 6: Training, validation and testing costs as a function of the degree l .

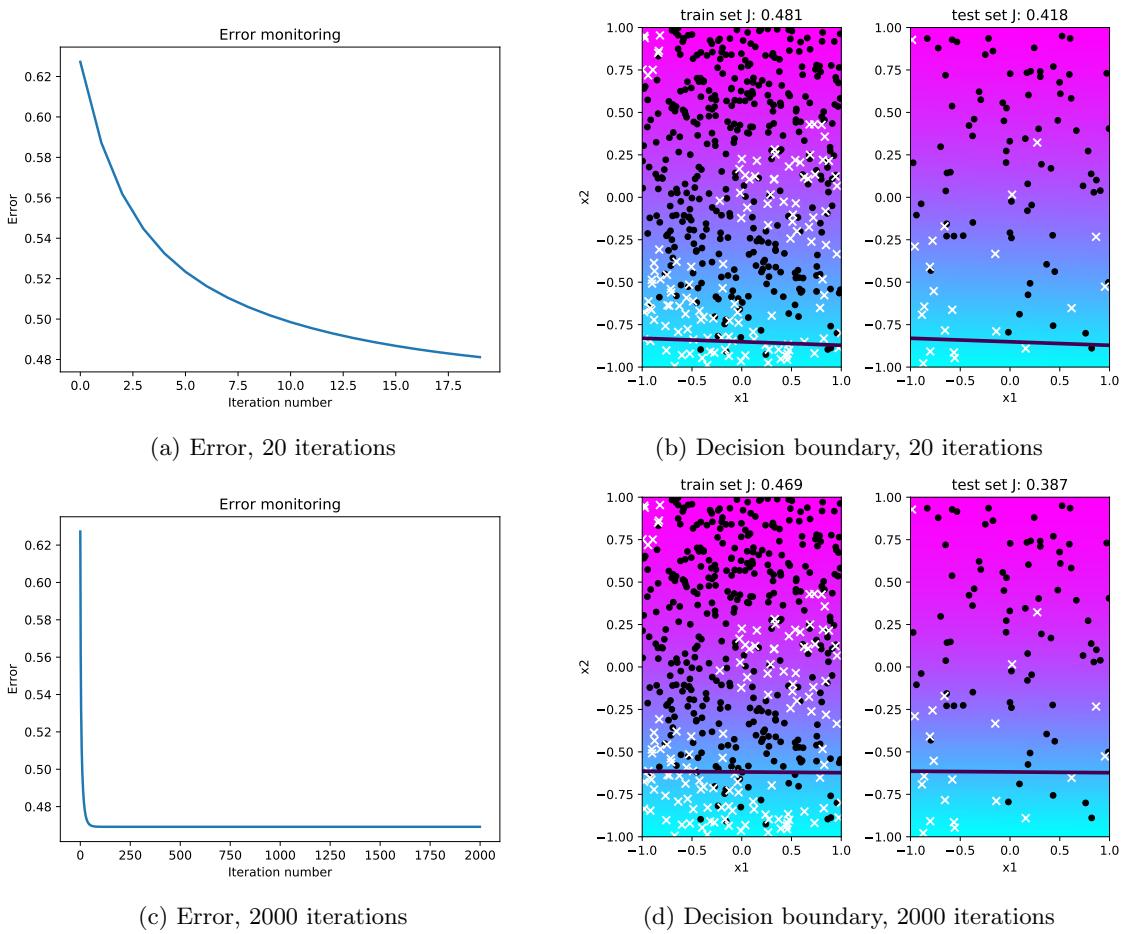


Figure 7: GD errors and decision boundaries for varying number of iterations, degree $l = 1$ and learning rate $\eta = 1$.

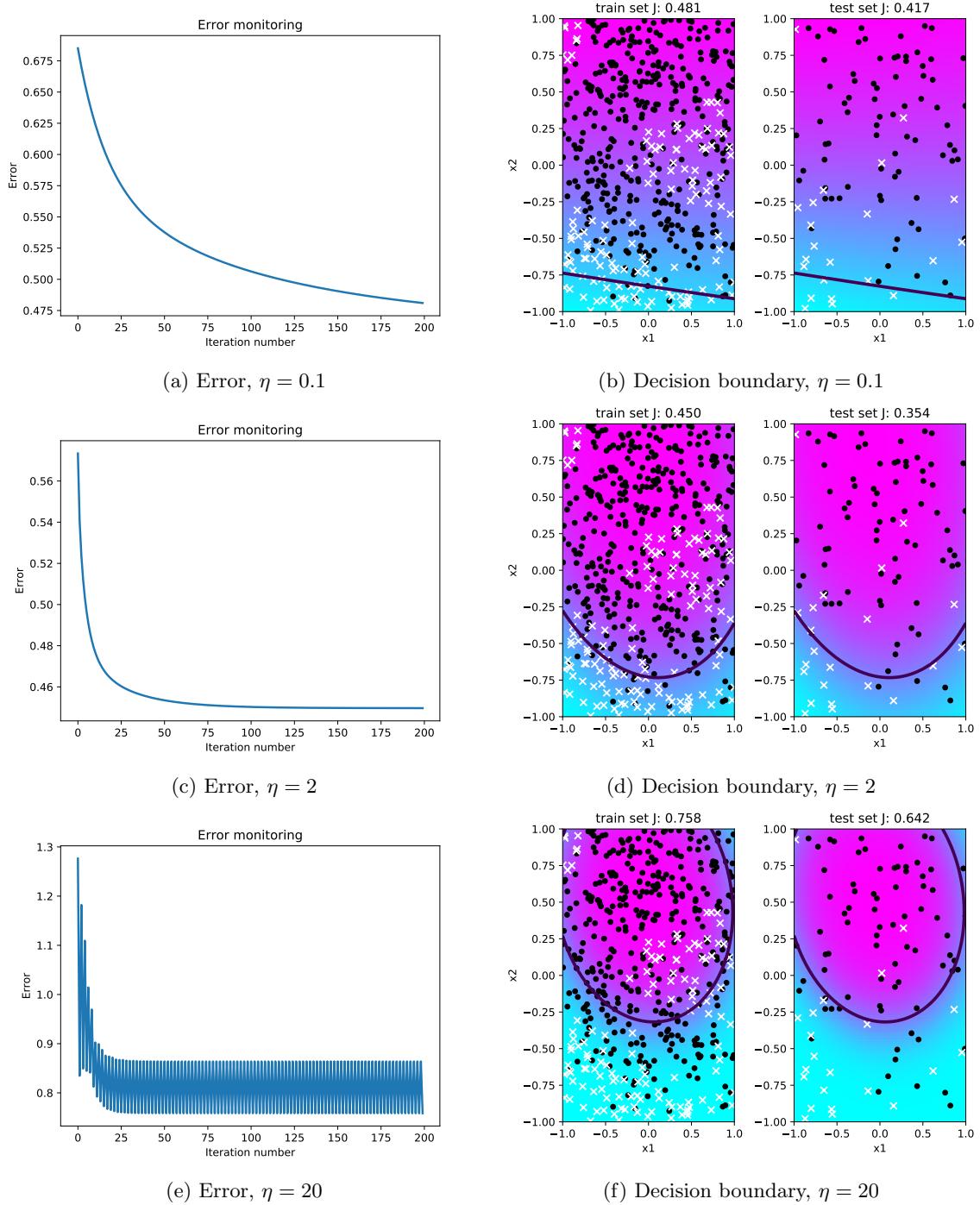


Figure 8: GD errors and decision boundaries for varying learning rate η , degree $l = 2$ and 200 iterations.

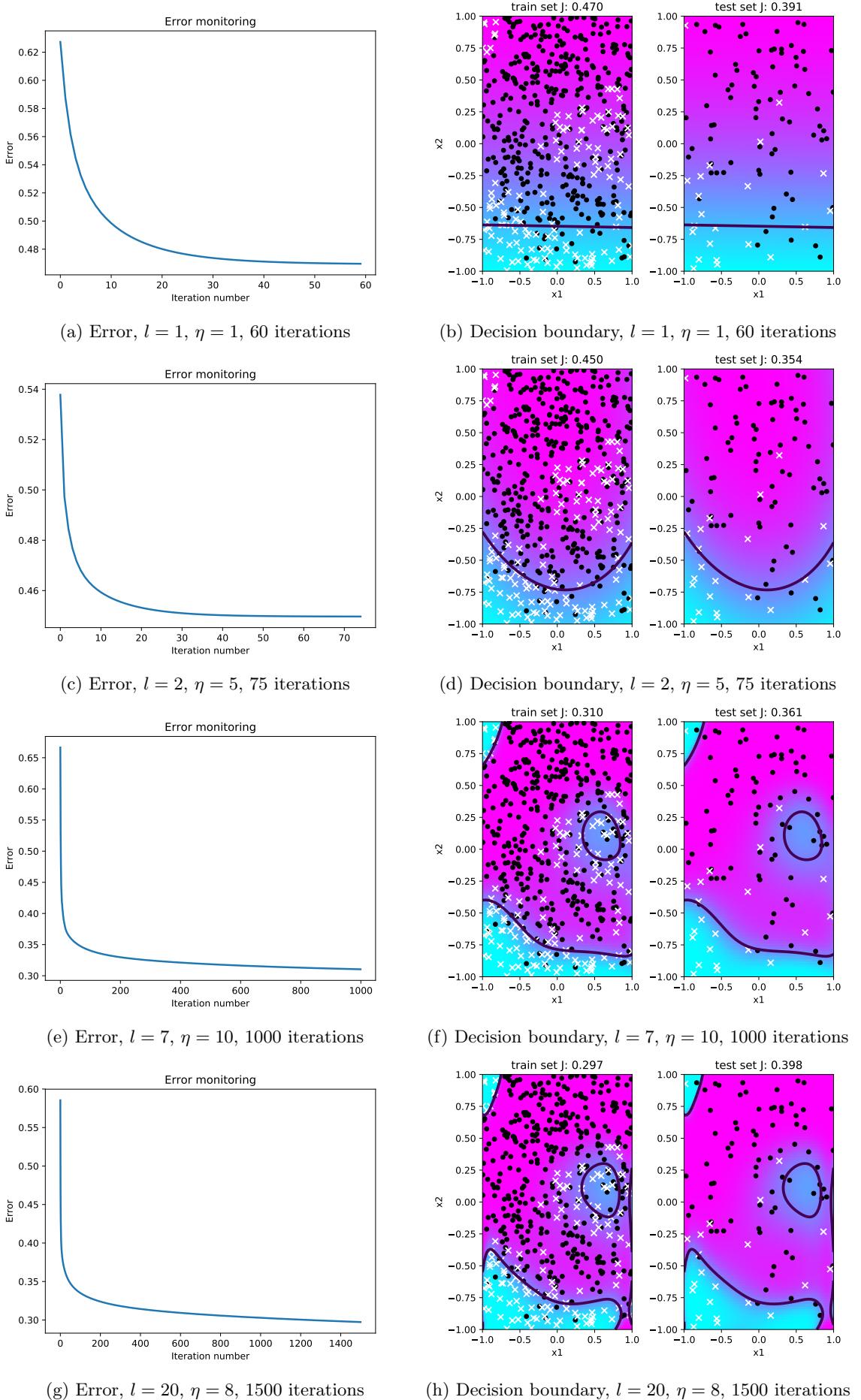


Figure 9: GD errors and decision boundaries for degrees $l = 1, 2, 7, 20$ and chosen parameter values.