

Prob. 1

(a) Plot for **identity** basis are shown in Figure 1.

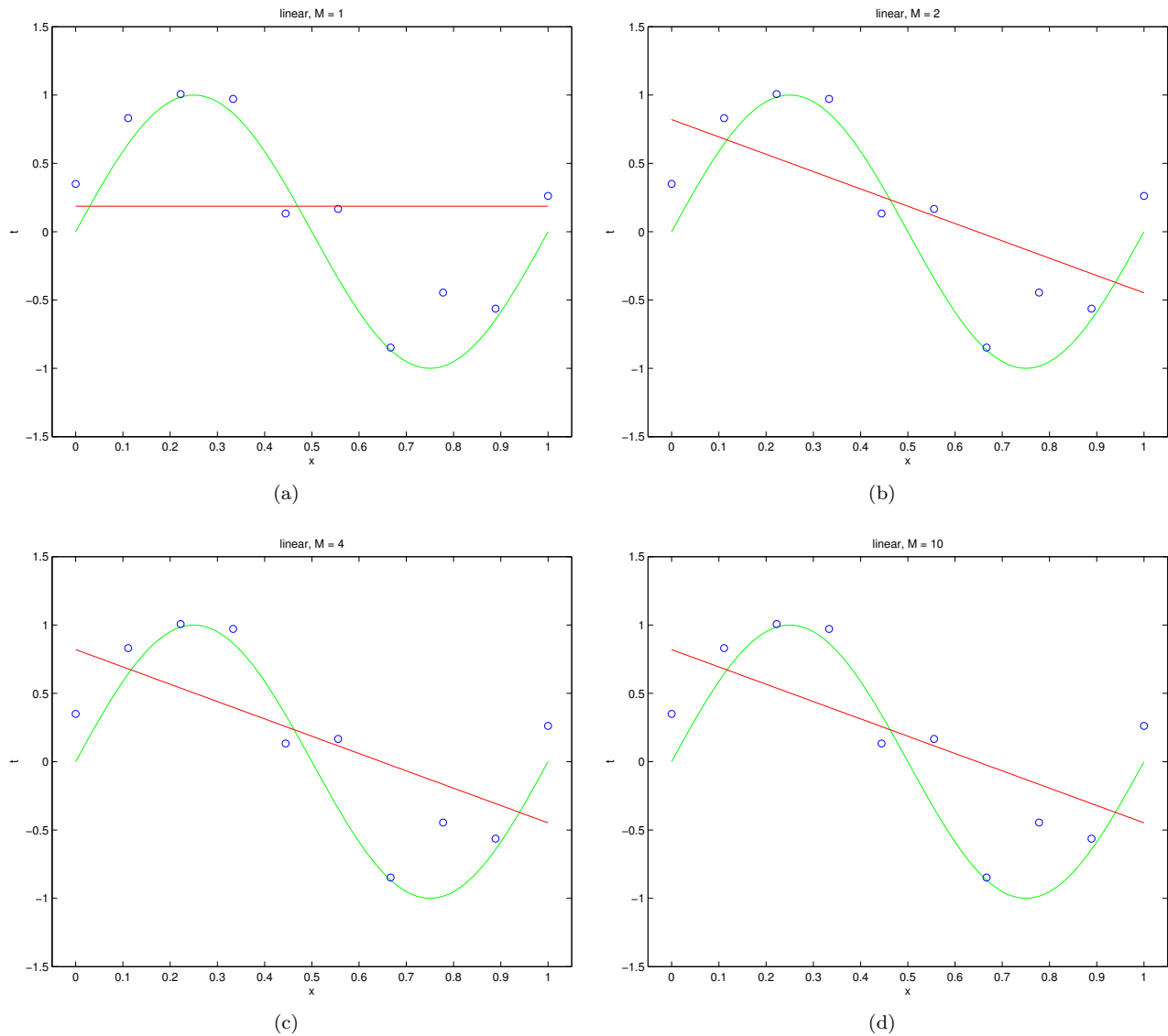
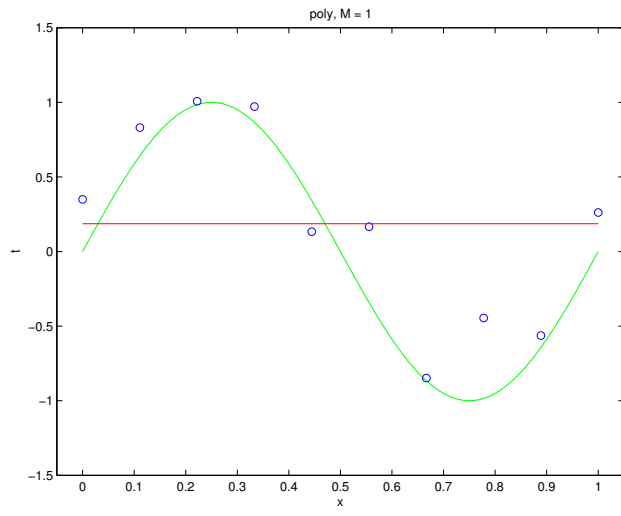
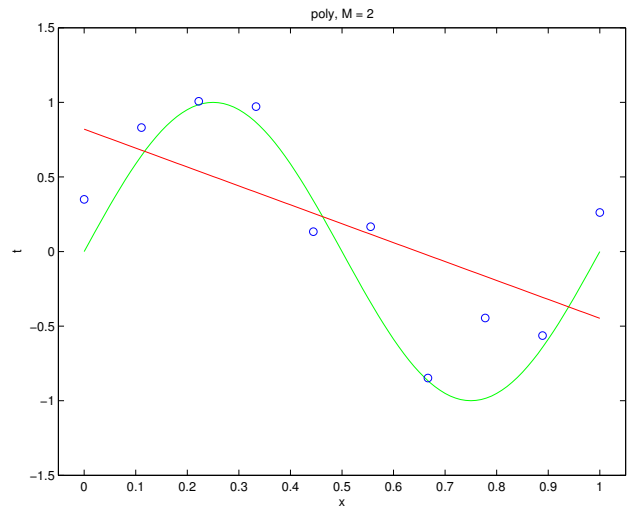


Figure 1: Recreation of Figure 1.4 for **identity** basis (a) $M = 1$, (b) $M = 2$, (c) $M = 4$, and (d) $M = 10$.

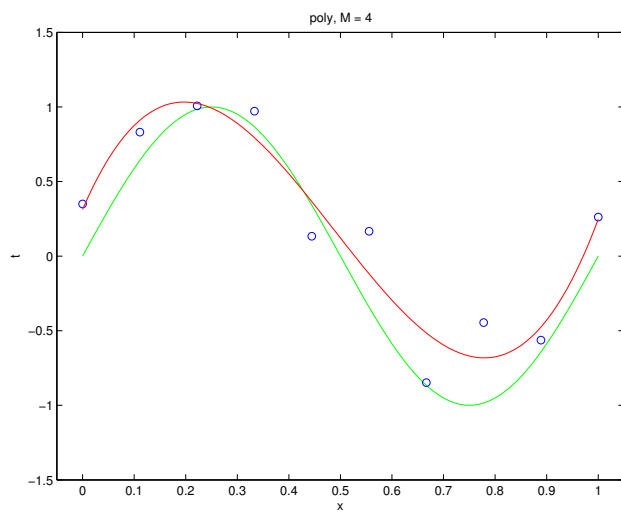
(b) Plot for **polynomial** basis are shown in Figure 2.



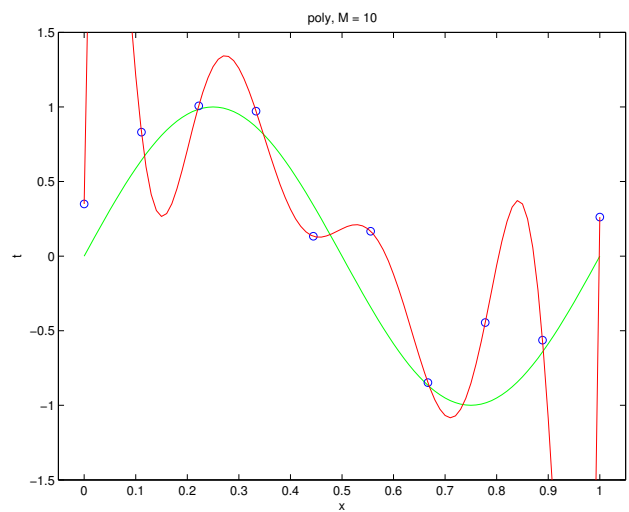
(a)



(b)



(c)



(d)

Figure 2: Recreation of Figure 1.4 for **polynomial** basis (a) $M = 1$, (b) $M = 2$, (c) $M = 4$, and (d) $M = 10$.

(c) Plot for **Gaussian** basis are shown in Figure 3.

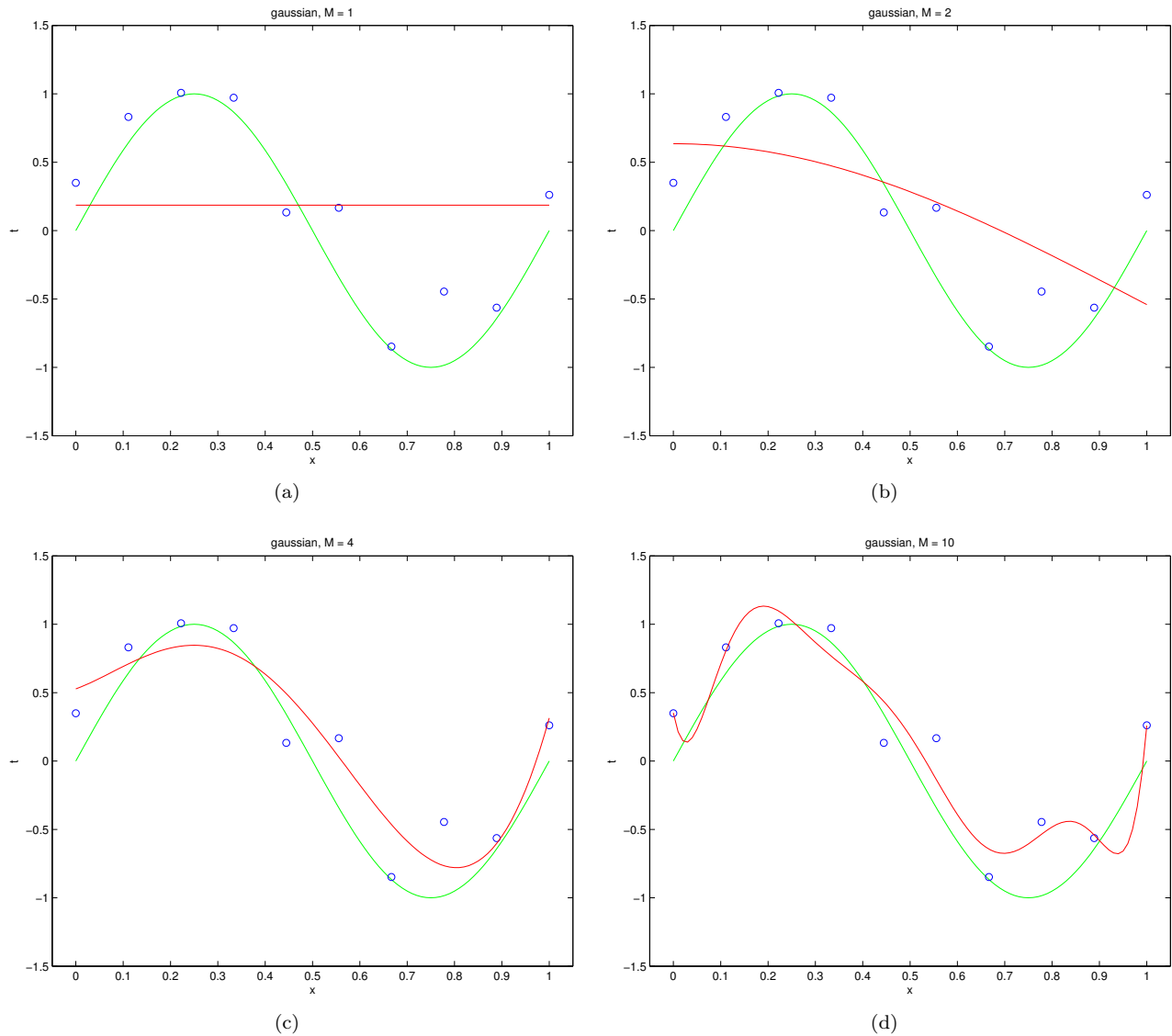


Figure 3: Recreation of Figure 1.4 for **Gaussian** basis (a) $M = 1$, (b) $M = 2$, (c) $M = 4$, and (d) $M = 10$.

(d) Plot for **sigmoid** basis are shown in Figure 4.

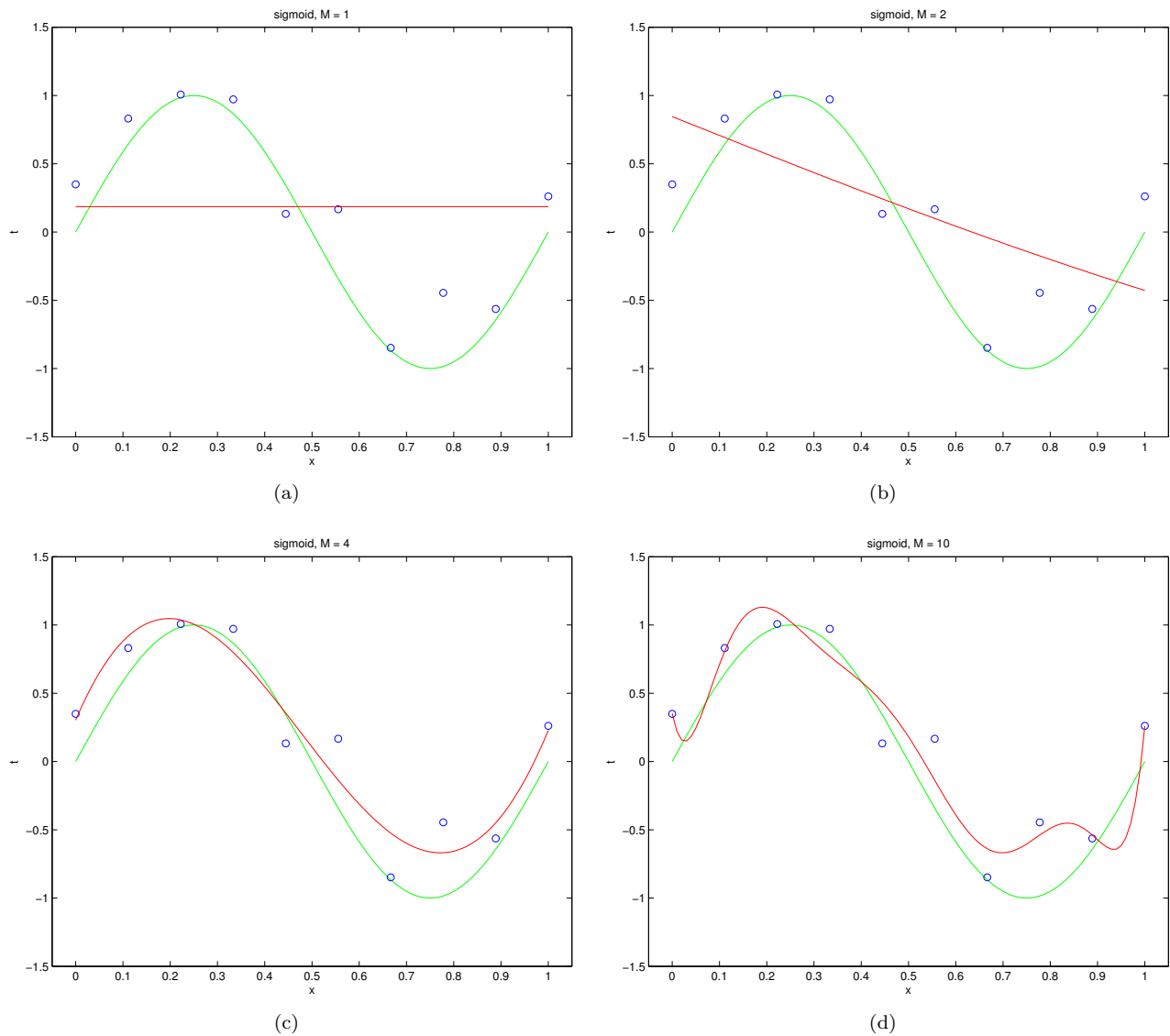
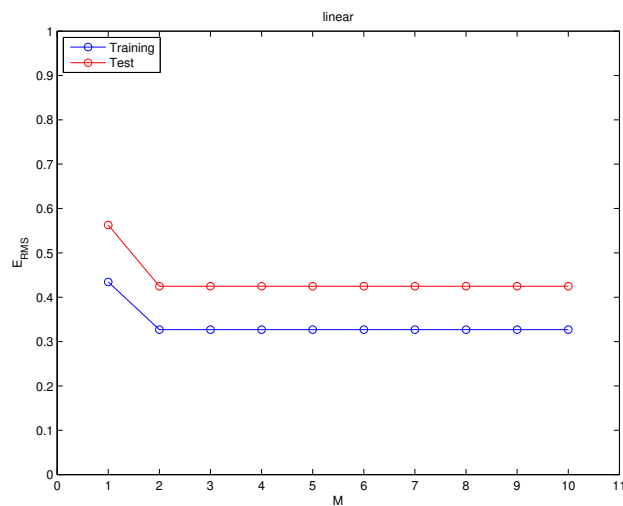


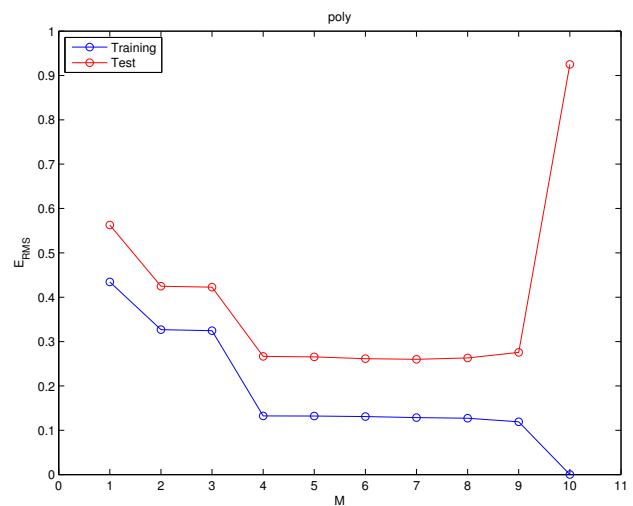
Figure 4: Recreation of Figure 1.4 for **sigmoid** basis (a) $M = 1$, (b) $M = 2$, (c) $M = 4$, and (d) $M = 10$.

Prob. 2

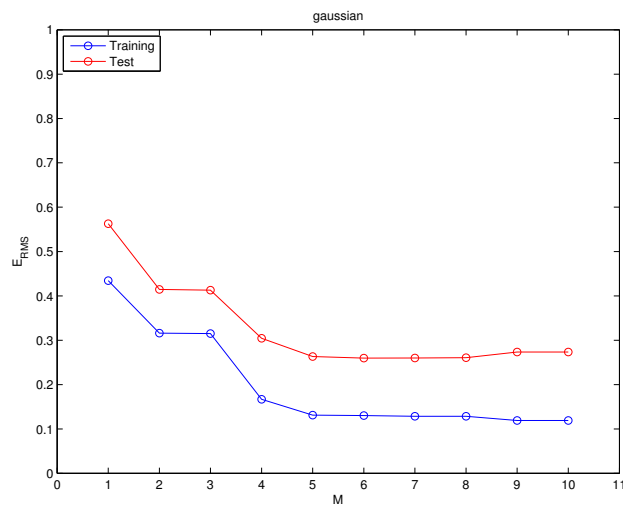
- (a) Plot for **linear** basis are shown in Figure 5(a).
 (b) Plot for **polynomial** basis are shown in Figure 5(b).
 (c) Plot for **Gaussian** basis are shown in Figure 5(c).
 (d) Plot for **sigmoid** basis are shown in Figure 5(d).



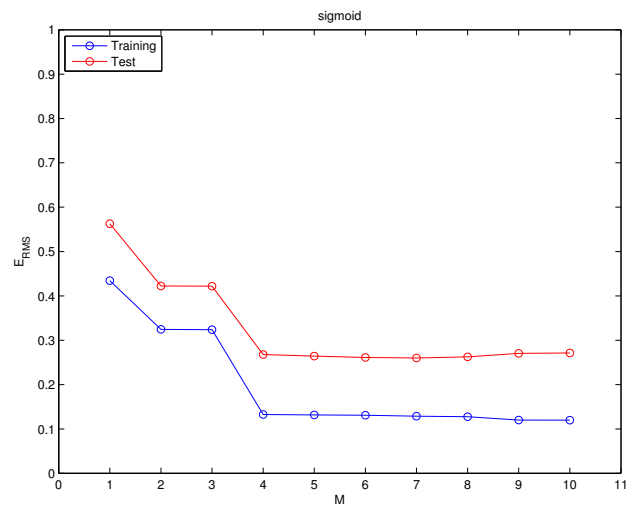
(a)



(b)



(c)



(d)

Figure 5: Recreation of Figure 1.5 for (a) **linear** basis, (b) **polynomial** basis, (c) **Gaussian** basis, and (d) **sigmoid** basis.

Prob. 3

- (a) Recreation for Figure 4.4 using least-squares classifier is shown in Figure 6(a) and (b).
- (b) Recreation for Figure 4.4 using Fisher Linear Discriminant is shown in Figure 6(c) and (d).
- (c) Recreation for Figure 4.4 using Perceptron is shown in Figure 6(e) and (f).
- (d) System accuracies are shown in Table 1.

Table 1: System accuracies for two-class classifiers

Classifier	w/o outliers	w/outliers
Least-squares	1.00	0.95
Fisher Linear Discriminant	1.00	0.86
Perceptron	1.00	1.00

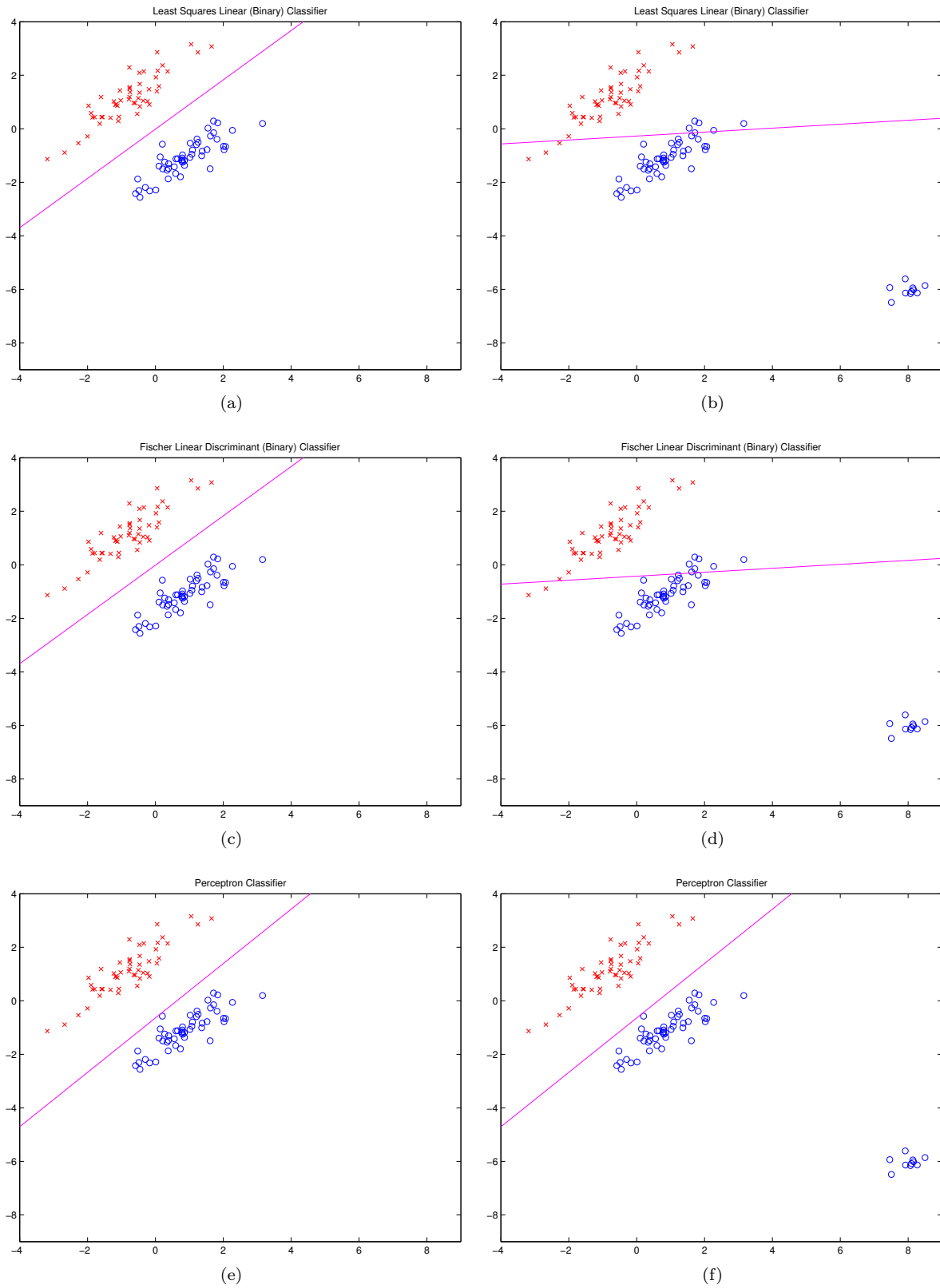


Figure 6: Recreation of Figure 1.5 for (a), (b) **least-squares** classifier; (c), (d) **Fisher Linear Discriminant**; and (e), (f) **perceptron**. Left column has data with no outliers and right column has data with outliers.

Prob. 4

- (a) Recreation for Figure 4.5 using least-squares classifier is shown in Figure 7.
- (b) For the three-class LS classifier, system accuracy is 72% (your mileage may vary).

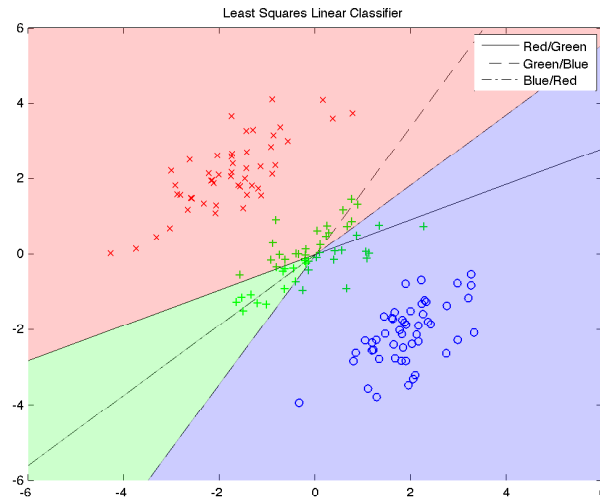


Figure 7: Recreation of Figure 4.5 Least-squares multi-class classifier.

Prob. 5

(a) Recreation for Figure 4.4 using probabilistic generative model is shown in Figure 8(a) and (b). The (optional) class-conditional densities are shown in Figure 8(c).

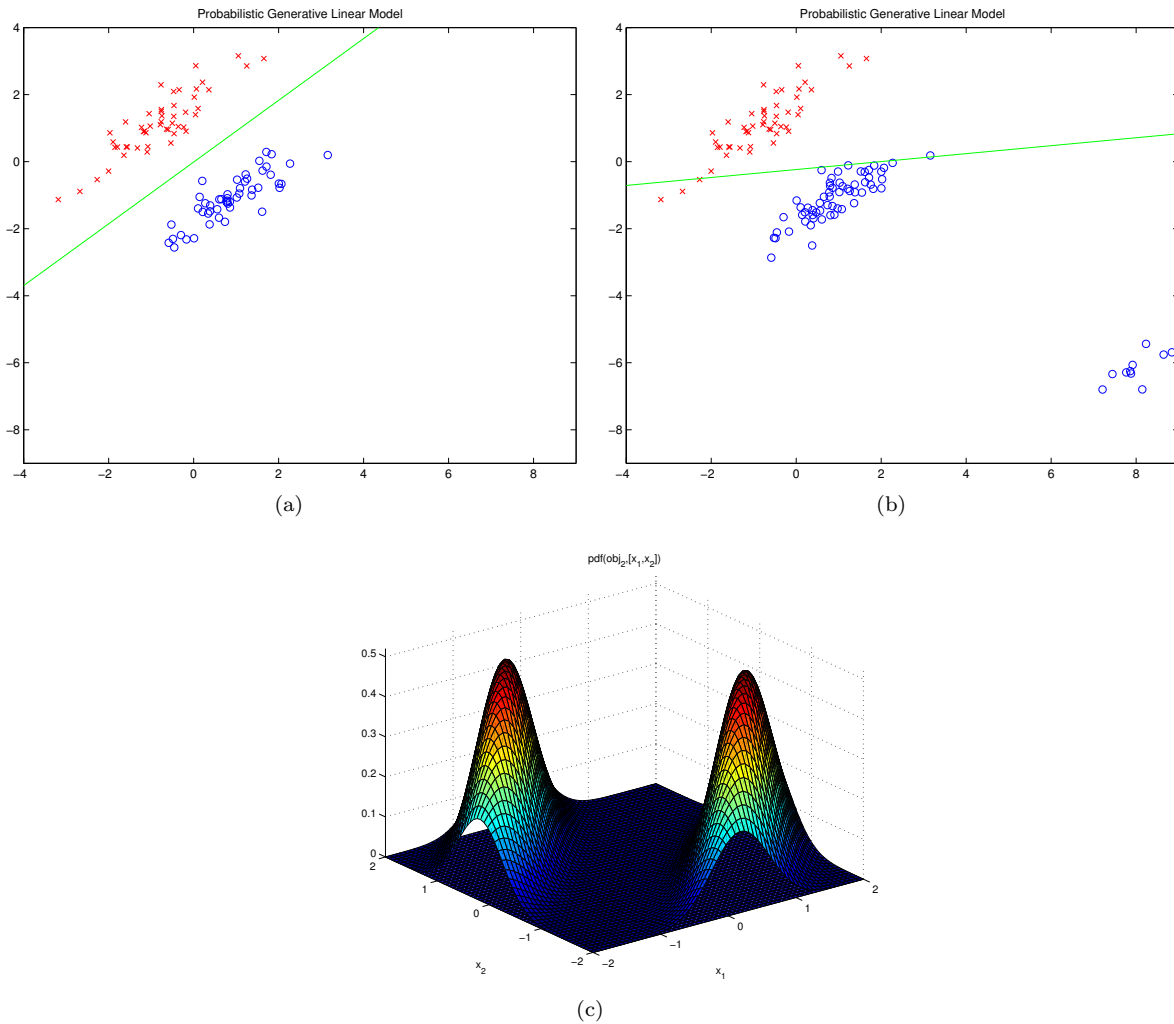


Figure 8: Recreation of Figure 4.4 using a probabilistic generative model