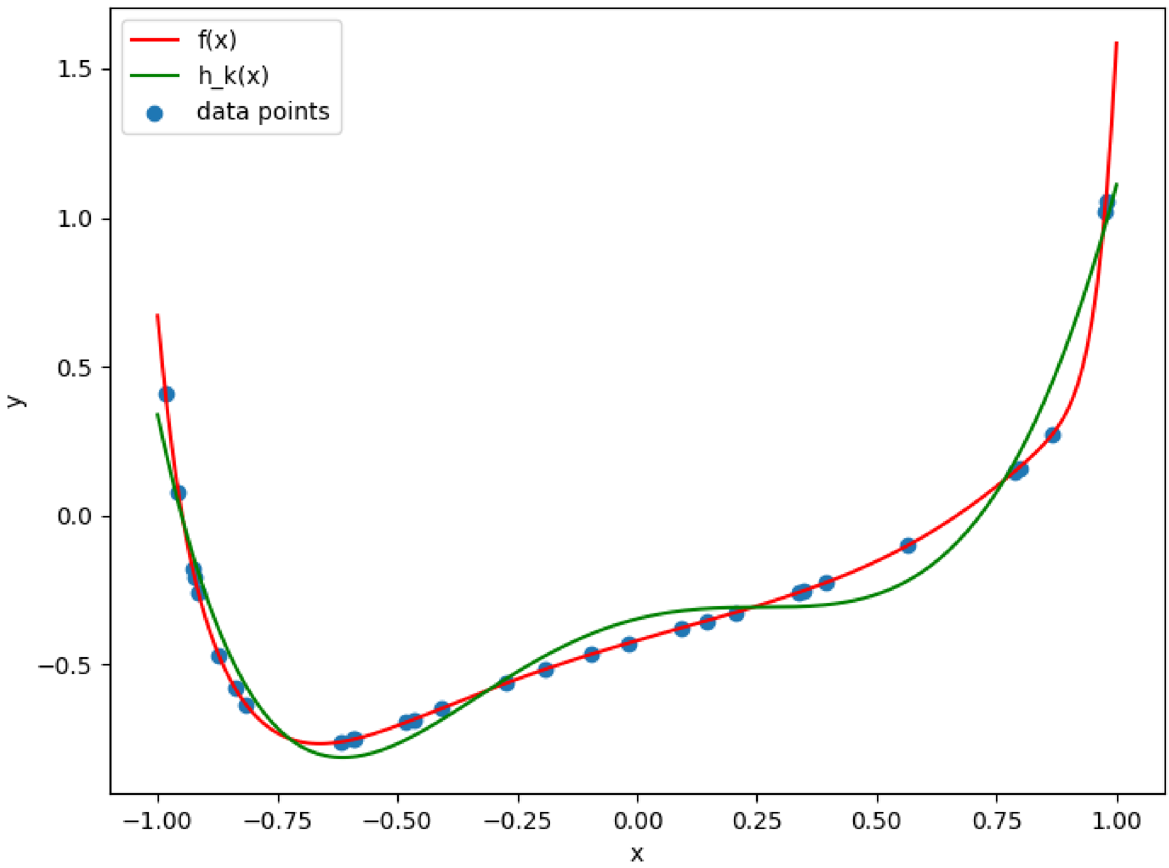
(b)



(c)

k	N	E_D(E_in)	E_D(E_out)
3	10	0.008	0.2185
3	100	0.02666	0.03241
5	10	0.0005	7.1229
5	100	0.005101	0.0079006
7	10	0.00002684	1692.029
7	100	0.001261	0.0027701

With the same N, E_D(E_in) decreases when k increases, as our model function becomes closer to target function;

E_D(E_out) also decreases when k increases and N = 100 also because our model function is closer to target function, but it increases when k increases and N = 10 maybe because of overfitting.

With the same k, E_D(E_in) increases when k increases because it overfits when N = 10 and E_D(E_out) decreases when k increases because our model function is closer to target function.

(d)

k	N	E_D(E_in)	E_D(E_out)
3	10	0.01441	0.1745
3	100	0.03596	0.03275
5	10	0.004607	154.4132
5	100	0.014505	0.008554
7	10	0.002034	5702756.4317
7	100	0.01048	0.003784

Yes, results are affected by noise. k = 7 N = 10 gets affected most. Because model is the most complicated and number of data points is small, these lead to the most overfitting.

(e)

alpha	0	0.00005	0.05	5	500
E_D(E_in)	0.006371	0.007066	0.008791	0.03888	0.2370
E_D(E_out)	37.365	0.07806	0.008955	0.04796	0.2275

alpha = 0.05 leads to minimum out of sample error. It is the best.