Homework #2

1. Regression: quadratic function optimization

You have four samples as follows: D = {(x, t)| (-1, 1), (0, 1), (1, 1), (1, 0) }

a) Your model is $f(x) = w_1 x + w_0$. You have to find w_1 and w_0 so that $f(x)$ best fits the samples. Make a quadratic function to optimize. Find the solution by solving linear equations.

b) Your model is $f(x) = w_1 \cos \pi x + w_0$. You have to find w_1 and w_0 so that $f(x)$ best fits the samples. Make a quadratic function to optimize. Find the solution by solving linear equations.

2. Regression based on Matrix operations

You have four samples as follows: D = {(x, t)| (-1, 1), (0, 1), (1, 1), (1, 0) }

a) Your model is $f(x) = w_1 x + w_0$. You have to find w_1 and w_0 so that $f(x)$ best fits the samples using matrix operations. You may use programs or packages for matrix operations.

b) Your model is $f(x) = w_1 \cos \pi x + w_0$. You have to find w_1 and w_0 so that $f(x)$ best fits the samples using matrix operations. You may use programs or packages for matrix operations.

c) Your model is $f(x) = w_2 x^2 + w_1 x + w_0$. You have to find w_2, w_1 and w_0 so that $f(x)$ best fits the samples using matrix operations. You may use programs or packages for matrix operations.

d) Your model is $f(x) = w_2 \exp(-(x+1)^2) + w_1 \exp(-x^2) + w_0$. You have to find w_2, w_1 and w_0 so that $f(x)$ best fits the samples using matrix operations. You may use programs or packages for matrix operations.

3. Regression based on Matrix operations

You have data samples as follows.

a) Your model is $\mathbf{Price} = w_3 \cdot \frac{\mathbf{HP}}{\mathbf{Age}} + w_2 \cdot \log \mathbf{HP} + w_1 \cdot \mathbf{Brand} \cdot \sqrt{\mathbf{MPG}} + w_0$. Find the best Price function using matrix operations.

id	Age	HP	Brand	MPG	Price
Car 1	2	200	4	27	30,000
Car 2	5	150	3	35	20,000
Car 3	3	180	4	25	25,000
Car 4	1	230	2	10	21,000
Car 5	5	180	5	40	38,000
Car 6	4	210	3	30	31,000