Question 1

$$\hat{y}_i = w_0 + \sum_{d=1}^{p} x_{id} w_d$$

$$w_0 = \frac{(\Sigma y)(\Sigma x^2) - (\Sigma x)(\Sigma xy)}{n(\Sigma x^2) - (\Sigma x)^2}$$

$$= \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{n(\Sigma x^2) - (\Sigma x^2)}$$

a) $y = 19370.11 + X \cdot (9.77)$

↑ y-intercept ↑ slope

b) y-intercept = 19370.11

slope = 9.77

c) $y = 19370.11 + 5.000 \times 9.77$

$y = 68220.11$

Question 2

a. yes, it converges

b.

Step	Weights	Score	Correct
1	(1,0,0,0)	$(1,0,0,0)\times f_1 = 1$	no $-f_1$
2.	(0,-4,-3,-6)	$(0,-4,-3,-6)\times f_2 = -20$	no $-f_2$
3.	(1,-2,-5,-3)	$(1,-2,-5,-3)\times f_3 = 8$	yes
4.	(1,-2,-5,-3)	$(1,-2,-5,-3)\times f_4 = -26$	yes
5.	(1,-2,-5,-3)	$(1,-2,-5,-3)\times f_1 = -40$	yes
6.	(1,-2,-5,-3)	$(1,-2,-5,-3)\times f_2 = -2$	no $-f_2$
7.	(2,0,-7,0)	$(2,0,-7,0)\times f_3 = 2$	yes
8	(2,0,-7,0)	$(2,0,-7,0)\times f_4 = -12$	yes
9.	(2,0,-7,0)	$(2,0,-7,0)\times f_1 = -19$	yes
10.	(2,0,-7,0)	$(2,0,-7,0)\times f_2 = 16$	yes

After 6 steps algorithm will converge.

Final weights: (2,0,-7,0)

Question 3

$W_A = (1,2,3)$ $W_B = (-1,0,2)$ $W_C = (0,-2,1)$

$x = (x_0, x_1, x_2) = (1,-3,1)$

a. $W_A \cdot f(x) = 1\cdot 1 + 2\cdot(-3) + 3\cdot 1 = -2$

$W_B \cdot f(x) = -1\cdot 1 + (-3)\cdot 0 + 2\cdot 1 = 1$

$W_C \cdot f(x) = 0\cdot 1 + (-3)\cdot(-2) + 1\cdot 1 = 7$

thus the predicted class is W_C

b. $W_A = (1,2,3)$

$W_B = (-1,0,2) + f(x) = (-1,0,2) + (1,-3,1) = (0,-3,3)$

$W_C = (0,-2,1) - f(x) = (0,-2,1) - (1,-3,1) = (-1,1,0)$