

① a) We need at least 3 parameters

$$y = ax_1 + bx_2 + c$$

b)

$$y = \begin{bmatrix} 10 \\ 40 \\ 90 \\ 60 \\ 70 \\ 50 \\ 30 \\ 20 \\ 40 \\ 90 \end{bmatrix}_{10x1} \quad x = \begin{bmatrix} 1 & 1 & 5 \\ 1 & 2 & 6 \\ 1 & 2 & 10 \\ 1 & 2 & 12 \\ 1 & 3 & 14 \\ 1 & 3 & 12 \\ 1 & 4 & 6 \\ 1 & 4 & 5 \\ 1 & 4 & 7 \\ 1 & 5 & 10 \end{bmatrix}_{10x3} \quad b = \begin{bmatrix} b_0 \\ b_1 \\ b_2 \end{bmatrix}$$

$$\hat{b} = (x^T x)^{-1} (x^T y)$$

$$= \begin{bmatrix} 10 & 30 & 90 \\ 30 & 104 & 280 \\ 90 & 270 & 948 \end{bmatrix}_{3x3}^{-1} (x^T y)$$

~~$$= \begin{bmatrix} 1.329 & 15 \end{bmatrix}$$~~

$$\begin{bmatrix} 440 \\ 1380 \\ 4560 \end{bmatrix}_{3x1}$$

$$\hat{b} = \begin{bmatrix} -1286 \\ 161 \\ 30/7 \\ 100/23 \end{bmatrix}_{3x1} \simeq \begin{bmatrix} -7.988 \\ 4.286 \\ 4.348 \end{bmatrix}_{3x1}$$

$$y = -7.988 + 4.286 x_1 + 4.348 x_2$$

DAOM 1

b) i) same as normal solution

ii) Code

c) i) $y = -7.988 + 4.286x_1 + 4.348x_2$

ii) $P_1 \Rightarrow y = 74.438$

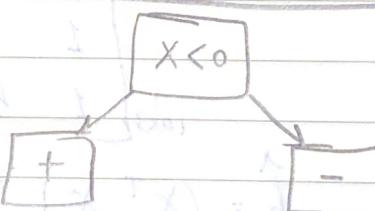
iii) $P_2 \Rightarrow y = 17.976$

iv) $P_3 \Rightarrow y = 36.834$

②

	x_1	x_2	y
P_1	-1	1	+
P_2	-0.7	1	+
P_3	-0.4	1	+
P_4	-0.1	1	-
P_5	0.2	1	+
P_6	0.5	1	-
P_7	0.8	1	+

(1st)



$$w = \frac{1}{7} \quad E = \sum w_i = \frac{2}{7}$$

$$\alpha = \frac{1}{2} \log \frac{1 - \frac{2}{7}}{\frac{2}{7}}$$

$$\alpha = \frac{1}{2} \log(2.5)$$

(2nd)

$$w = 1/10$$

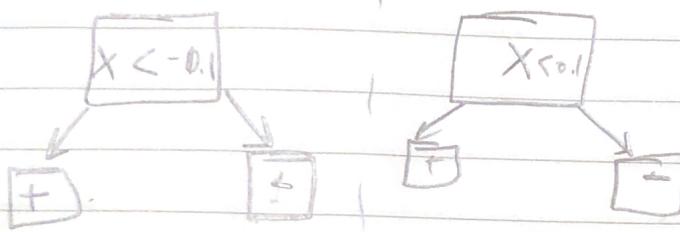
$$w_x = \frac{1}{4}$$

2nd
3rd



2nd Rate

3rd



$$\epsilon = \frac{1}{4}$$

$$\epsilon = \frac{2}{5}$$

$$d = \frac{1}{2} \log 3$$

$$d = \frac{1}{2} \log 3/2$$

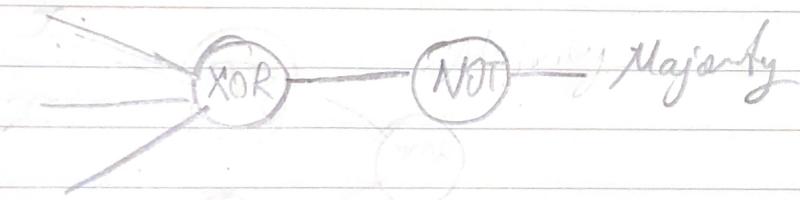
$$w_V = \frac{1}{15}$$

$$w_X = \frac{2}{15}$$

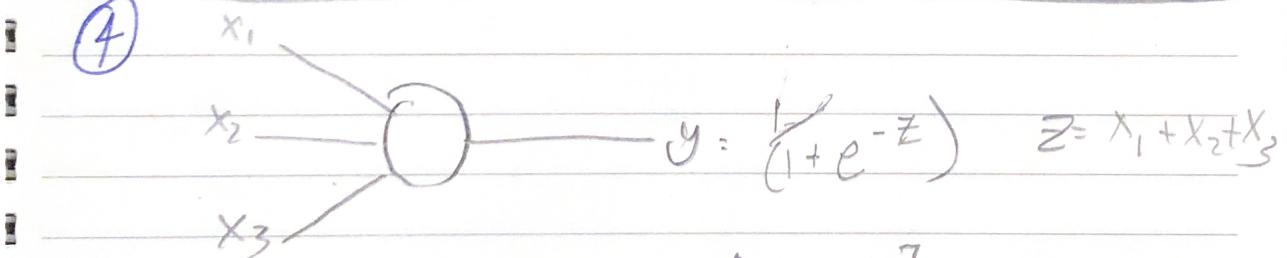
$$w_V = \frac{1}{10}$$

$$w_X = \frac{1}{2}$$

(3)



(4)



$$C = [-d \log y - (1-d) \log (1-y)]$$

$$\begin{aligned} \text{a) } \frac{\partial y}{\partial z} &= -[(1+e^{-z})^{-2}] \times (e^z) \\ &= \frac{e^z}{(1+e^{-z})^2} \end{aligned}$$

b) x_1, x_2, x_3 are
only needed

$$\frac{\partial C}{\partial y} = \frac{-dx}{y \ln 10} - \frac{(1-d)}{(1-y) \ln(10)}$$