Given: Covariance Matrix : $\begin{bmatrix} 14 & 0.7 \\ 0.7 & 2.81 \end{bmatrix}$

PCA

For eigen vectors, we solve $\det\left|\begin{bmatrix} (14-\lambda) & 0.7 \\ 0.7 & (2.81-\lambda) \end{bmatrix}\right| = 0$

we get $\lambda = \underbrace{14.0436}_{\text{greater}}, 2.76$

$\therefore \boxed{\lambda = 14.0436}$

Now, $\begin{bmatrix} 14 & 0.7 \\ 0.7 & 2.81 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 14.0436 \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$

we assume $x_1 = 1$ & get $x_2 = 0.0623$

$\therefore$ eigen vetor, $e = \begin{bmatrix} 1 \\ 0.0623 \end{bmatrix} = \begin{bmatrix} e_x \\ e_y \end{bmatrix}$

let eqn of the line of new axis be $y = mx + c$

Now, $m = \frac{e_y}{e_x}$

OR, $y = 0.0623x + c$

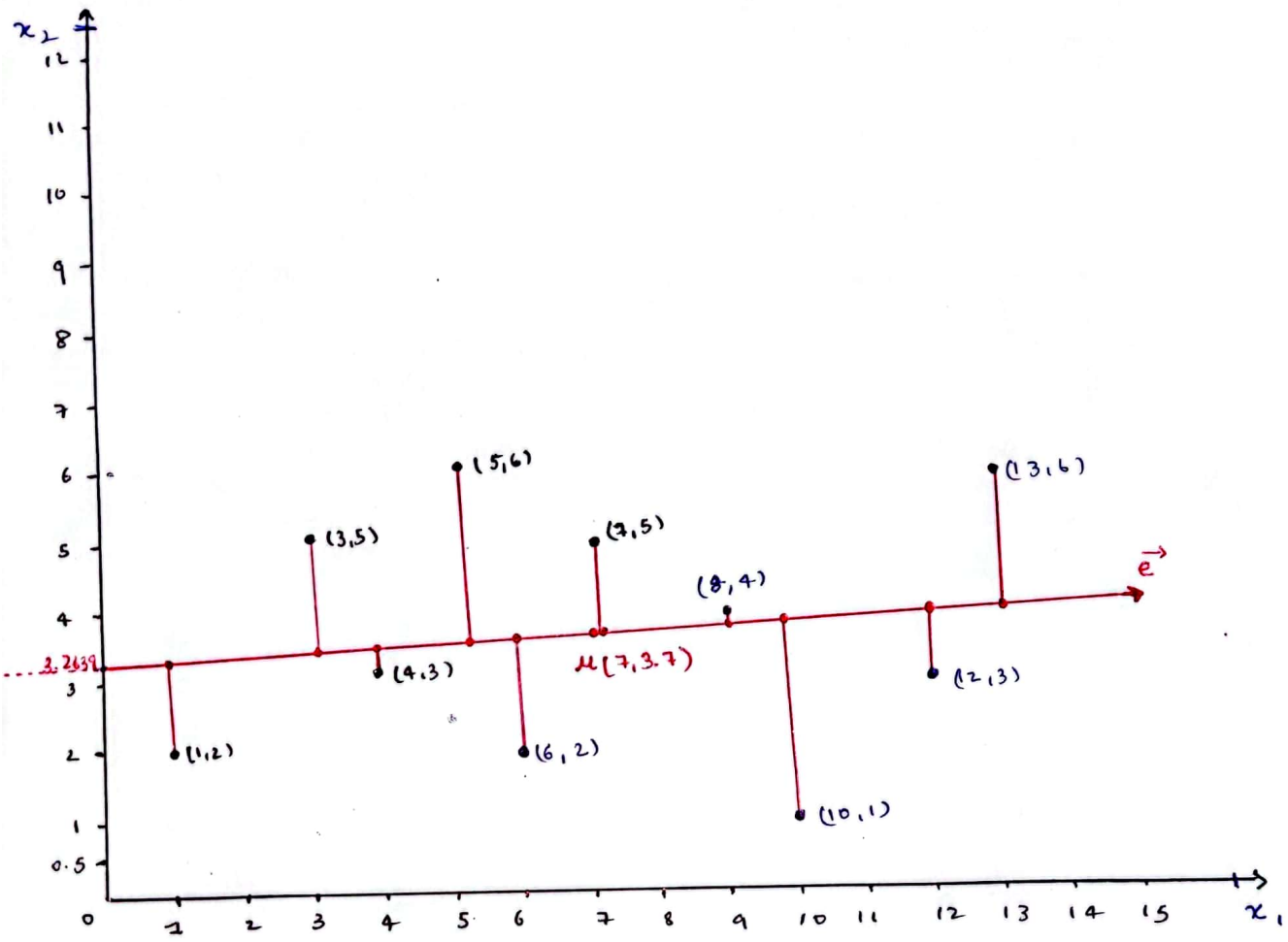
Also, the line passes through mean. ($u = \begin{bmatrix} u_x \\ u_y \end{bmatrix} = \begin{bmatrix} 7 \\ 3.7 \end{bmatrix}$

$\therefore u_y = 0.0623 \times u_x + c$

OR, $3.7 = 0.0623 \times 7 + c$

OR $\boxed{c = 3.2639}$

$\therefore$ eqn of line is $\boxed{y = 0.0623x + 3.2639}$


x2
12
11
10
9
8
7
6
5
4
3.2639
3
2
1
0.5
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
x1
(1,2)
(3,5)
(4,3)
(5,6)
(6,2)
(7,5)
μ(7,3.7)
(8,4)
(10,1)
(12,3)
(13,6)
e