

Download the python code from the below link

<https://github.com/BINDUSREE53/BINDUSREE53-PROBABILITY-AND-RANDOM-VARIABLES-ASSIGNMENTS/blob/0664676c3ae796c588f0a8bba11d5ded85a31184/assignment1.py>

Download the latex code from the below link

<https://github.com/BINDUSREE53/BINDUSREE53-PROBABILITY-AND-RANDOM-VARIABLES-ASSIGNMENTS/blob/0664676c3ae796c588f0a8bba11d5ded85a31184/assignment1.tex>

Question 5@ solution:

Given a matrix $B = \begin{bmatrix} 1 & 1 \\ 8 & 3 \end{bmatrix}$

And a matrix X such that $X = B^2 - 4B$

$$\begin{aligned} B^2 &= \begin{bmatrix} 1 & 1 \\ 8 & 3 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 8 & 3 \end{bmatrix} \\ &= \begin{bmatrix} 1 \times 1 + 1 \times 8 & 1 \times 1 + 1 \times 3 \\ 8 \times 1 + 3 \times 8 & 8 \times 1 + 3 \times 3 \end{bmatrix} \\ &= \begin{bmatrix} 1 + 8 & 1 + 3 \\ 8 + 24 & 8 + 9 \end{bmatrix} \\ &= \begin{bmatrix} 9 & 4 \\ 32 & 17 \end{bmatrix} \end{aligned} \quad (1)$$

$$\begin{aligned} 4B &= \begin{bmatrix} 4 \times 1 & 4 \times 1 \\ 4 \times 8 & 4 \times 3 \end{bmatrix} \\ &= \begin{bmatrix} 4 & 4 \\ 32 & 12 \end{bmatrix} \end{aligned} \quad (2)$$

Substituting (1) and (2) in $X = B^2 - 4B$ gives

$$\begin{aligned} X &= \begin{bmatrix} 9 & 4 \\ 32 & 17 \end{bmatrix} - \begin{bmatrix} 4 & 4 \\ 32 & 12 \end{bmatrix} \\ &= \begin{bmatrix} 9 - 4 & 4 - 4 \\ 32 - 32 & 17 - 12 \end{bmatrix} \\ &= \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix} \end{aligned}$$

Therefore, $X = \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix}$

Given that $X \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 5 \\ 50 \end{bmatrix}$

$$\begin{aligned} X \begin{bmatrix} a \\ b \end{bmatrix} &= \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} \\ &= \begin{bmatrix} 5 \times a + 0 \times b \\ 0 \times a + 5 \times b \end{bmatrix} \\ &= \begin{bmatrix} 5a \\ 5b \end{bmatrix} = \begin{bmatrix} 5 \\ 50 \end{bmatrix} \end{aligned}$$

$$\begin{bmatrix} 5a \\ 5b \end{bmatrix} = \begin{bmatrix} 5 \\ 50 \end{bmatrix}$$

Comparing L.H.S values in left side matrix with R.H.S values in right side matrix gives

$$5a = 5$$

$$5b = 50$$

From $5a = 5, a = 1$ and from $5b = 50, b = 10$.

Therefore the values of a, b are 1, 10 respectively.