

9.4.24

EE25BTECH11012-BEERAM MADHURI

Question:

A cottage industry produces a certain number of toys in a day. The cost of production of each toy (in rupees) was found to be 55 minus the number of toys produced in a day. On a particular day, the total cost of production was 750Rs. We would like to find out the number of toys produced on that day.

Solution:

Let number of toys produced per day = x

cost of each toy = $55 - x$

Total Cost of toys = $x(55 - x)$

On a particular day cost = 750

$$(55 - x)x = 750 \quad (0.1)$$

$$x^2 - 55x + 750 = 0 \quad (0.2)$$

this can be compared with the characteristic equation of a Matrix

$$A^2 - \text{tr}(A)A + (\det(A))I = 0 \quad (0.3)$$

$$\text{tr}(A) = 55 \quad (0.4)$$

$$\det(A) = 750 \quad (0.5)$$

from this Matrix A can be:

$$A = \begin{bmatrix} 0 & 1 \\ -750 & 55 \end{bmatrix} \quad (0.6)$$

Finding Eigenvalues of A

$$|A - \lambda I| = 0 \quad (0.7)$$

$$\begin{bmatrix} 0 & 1 \\ -750 & 55 \end{bmatrix} - \lambda \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = 0 \quad (0.8)$$

$$\begin{bmatrix} -\lambda & 1 \\ -750 & 55 - \lambda \end{bmatrix} = 0 \quad (0.9)$$

$$-\lambda(55 - \lambda) + 750 = 0 \quad (0.10)$$

By solving this equation, eigenvalues are:

$$\lambda_1 = 25, \quad \lambda_2 = 30 \quad (0.11)$$

\therefore no. of toys produced that day can be either 25 or 30.

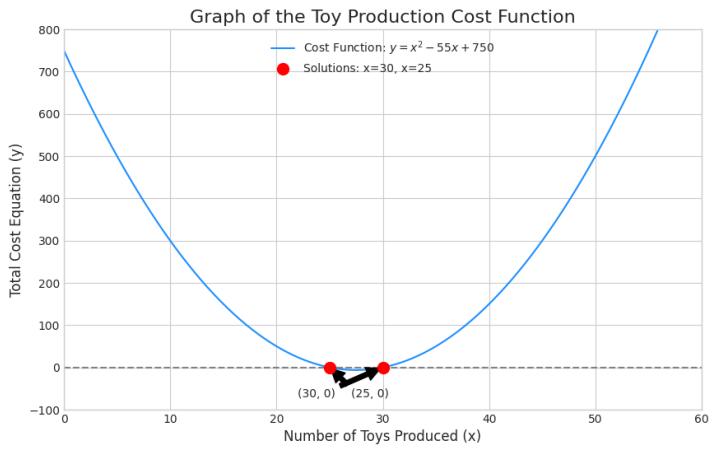


Fig. 0.1: 9.4.24