

## 9.4.16

EE25BTECH11004 - Aditya Appana

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### Question

Find the roots of the following quadratic equation graphically:

$$2x^2 - 7x + 3 = 0$$

### Solution

The parabola can be represented in vector form as:

$$\mathbf{x}^T \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} \mathbf{x} - \left(\frac{7}{2}\right)^T \mathbf{x} + \frac{3}{2} = 0 \quad (1)$$

The y-axis can be represented in vector form as:

$$\mathbf{x} = \kappa \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2)$$

We need to find the intersection of this line with the parabola, which can be done by substituting equation (2) in (1):

$$\kappa \begin{pmatrix} 1 \\ 0 \end{pmatrix}^T \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} \kappa \begin{pmatrix} 1 \\ 0 \end{pmatrix} - \left(\frac{7}{2}\right)^T \kappa \begin{pmatrix} 1 \\ 0 \end{pmatrix} + \frac{3}{2} = 0 \quad (3)$$

$$2\kappa^2 - 7\kappa + 3 = 0 \quad (4)$$

$$(2\kappa - 1)(\kappa - 3) = 0 \quad (5)$$

$$\kappa = \frac{1}{2}, 3 \quad (6)$$

Therefore, the points of intersection *i.e.* the **roots** are  $\begin{pmatrix} \frac{1}{2} \\ 0 \end{pmatrix}$  and  $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ .

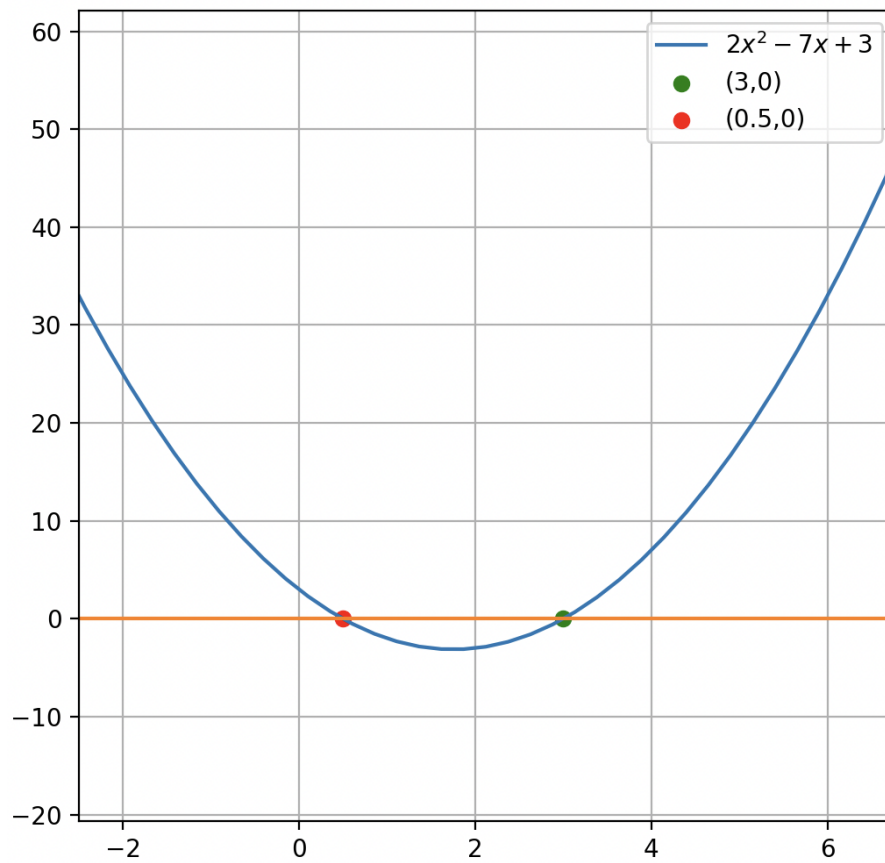


Figure 1: Plot