

Assignment 5

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Download all python codes from

<https://github.com/srikan-p/EE3900/tree/main/Assignment5/codes>

Download all latex codes from

<https://github.com/srikan-p/EE3900/tree/main/Assignment5>

PROBLEM

(Quadratic Forms Q2.19) Find the roots of $4x^2 + 3x + 5 = 0$.

SOLUTION

The given equation can be written as,

$$\mathbf{x}^T \begin{pmatrix} 4 & 0 \\ 0 & 0 \end{pmatrix} \mathbf{x} + \begin{pmatrix} 3 & 0 \end{pmatrix} \mathbf{x} + 5 = 0 \quad (0.0.1)$$

where,

$$\mathbf{x} = \begin{pmatrix} x \\ 0 \end{pmatrix} \quad (0.0.2)$$

Substituting (0.0.2) in (0.0.1),

$$\begin{pmatrix} x \\ 0 \end{pmatrix}^T \begin{pmatrix} 4 & 0 \\ 0 & 0 \end{pmatrix} \begin{pmatrix} x \\ 0 \end{pmatrix} + \begin{pmatrix} 3 & 0 \end{pmatrix} \begin{pmatrix} x \\ 0 \end{pmatrix} + 5 = 0 \quad (0.0.3)$$

$$\implies 4x^2 + 3x + 5 = 0 \quad (0.0.4)$$

$$\implies \left(2x + \frac{3}{4}\right)^2 = -\frac{71}{16} \quad (0.0.5)$$

The square of a real number is always non-negative. In (0.0.5), we can say that $2x + \frac{3}{4}$ is not a real number. So, the roots are not real. From the figure, we can see that the function does not cross the x-axis, so, the quadratic equation has no real roots.

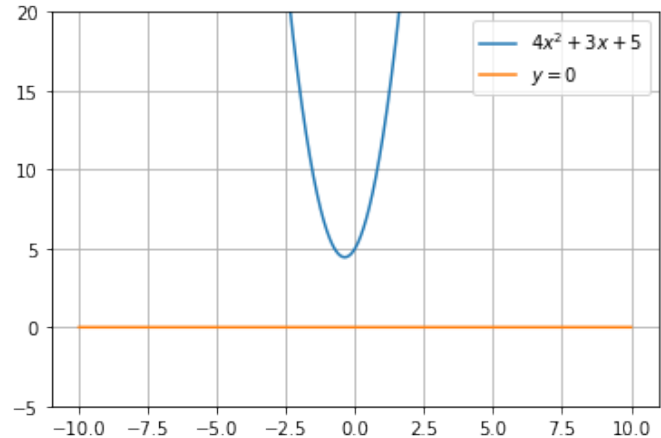


Fig. 0: Plot of the function