

# ASSIGNMENT-4

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Download all python codes from

<https://github.com/ThurpuNaveena/Assignment-4/blob/main/Assignment-4.py>

and latex-tikz codes from

<https://github.com/ThurpuNaveena/Assignment-4/blob/main/main.tex>

## 1 QUESTION No 2.25

Find the discriminant of the quadratic equation  $3x^2 - 2x + \frac{1}{3} = 0$  hence find the nature of its roots.

## 2 SOLUTION

Given  $3x^2 - 2x + \frac{1}{3} = 0$  can be expressed as

$$\mathbf{x}^T \begin{pmatrix} 3 & 0 \\ 0 & 0 \end{pmatrix} \mathbf{x} + (-2 \quad -1) \mathbf{x} + \frac{1}{3} = 0 \quad (2.0.1)$$

Compare given quadratic equation  $3x^2 - 2x + \frac{1}{3} = 0$  with  $ax^2 + bx + c = 0$ , we get

$$a = 3, b = -2, c = \frac{1}{3} \quad (2.0.2)$$

$$\text{Discriminant}(D) = b^2 - 4ac \quad (2.0.3)$$

$$= (-2)^2 - 4(3)\left(\frac{1}{3}\right) \quad (2.0.4)$$

$$= 4 - 4 \quad (2.0.5)$$

$$= 0 \quad (\because D = 0) \quad (2.0.6)$$

Discriminant is zero and the nature of roots of equation  $3x^2 - 2x + \frac{1}{3} = 0$ . From the graph the quadratic equation will have intersect x-axis. If the discriminant is equal to zero, this means that the quadratic equation has two real, identical roots.

The roots are

$$\frac{-b}{2a}, \frac{-b}{2a} \quad (2.0.7)$$

$$\mathbf{x} = \frac{1}{3}, \frac{1}{3} \quad (2.0.8)$$

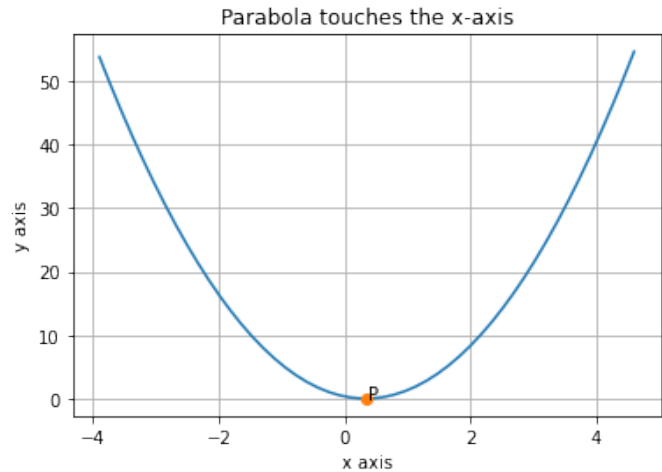


Fig. 2.1: Roots of  $3x^2 - 2x + 1/3 = 0$