Past Year JEE Questions

Questions

Quetion: 01

Let a and b respectively be the semitransverse and semi-conjugate axes of a hyperbola whose eccentricity satisfies the equation $9e^2 - 18e + 5 = 0$. If S(5, 0) is a focus and 5x = 9 is the corresponding directrix of this hyperbola, then $a^2 - b^2$ is equal to :

A. 7
B. -7
C. 5
D. -5

Solutions

Solution: 01

Explanation

As S(5, 0) is the focus.

$\therefore$ ae = 5   . . . (1)

As 5x = 9

$\therefore$ $x = \frac{9}{5}$ is the directrix

As we know directrix $= \frac{a}{e}$

$\therefore$ $\frac{a}{e} = \frac{9}{5}$ . . . .(2)

Solving (1) and (2), we get

a = 3 and e = $\frac{5}{3}$

As we know,

$b^2 = a^2 (e^2 - 1) = 9\left(\frac{25}{9} - 1\right) = 16$

$\therefore$ $a^2 - b^2 = 9 - 16 = -7$