

Cambridge International AS & A Level

Mathematics 9709

Paper 1 Pure Mathematics 1

Topic 1-Quadratics

Question No (2)

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Question No (2)

Find the real roots of the equation $\frac{18}{x^4} + \frac{1}{x^2} = 4$

Solution

Given equation

$$\frac{18}{x^4} + \frac{1}{x^2} = 4$$

$$\frac{18 + x^2}{x^4} = 4$$

$$18 + x^2 = 4x^4$$

$$4x^4 - 18 - x^2 = 0$$

$$4x^4 - x^2 - 18 = 0 \rightarrow \textcircled{1}$$

$$\text{let } x^2 = t$$

Equation (1) becomes

$$4t^2 - t - 18 = 0$$

By factorization

$$4t^2 - 9t + 8t - 18 = 0$$

$$t(4t - 9) + 2(4t - 9) = 0$$

$$(4t - 9)(t + 2) = 0$$

$$4t - 9 = 0, \quad t + 2 = 0$$

$$4t - 9 = 0$$

$$t = \frac{9}{4}$$

$$x^2 = \frac{9}{4}$$

$$x = \pm \frac{3}{2}$$

$$t = x^2$$

$$t + 2 = 0$$

$$t = -2$$

$$x^2 = -2$$

$$x = \pm \sqrt{-2}$$

Not real

