

Cambridge International AS & A Level

Mathematics 9709

Paper 1 Pure Mathematics 1

Topic 1-Quadratics

Question No (5)

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Question No (5)

Find the set of values of k for which the line $y = kx - 4$ intersects the curve $y = x^2 - 2x$ at two distinct points.

Solution

Equation of line

$$y = kx - 4 \rightarrow (1)$$

Equation of curve

$$y = x^2 - 2x \rightarrow (2)$$

put $y = kx - 4$ in (2)

$$kx - 4 = x^2 - 2x$$

$$x^2 - 2x - kx + 4 = 0$$

$$x^2 - x(2+k) + 4 = 0$$

As line intersects the curve at two points, so

$$b^2 - 4ac > 0$$

$$\text{disc} = b^2 - 4ac$$

$$(-(2+k))^2 - 4(1)(4) > 0$$

$$4 + 4k + k^2 - 16 > 0$$

$$k^2 + 4k - 12 > 0$$

$$k^2 + 6k - 2k - 12 > 0$$

$$k(k+6) - 2(k+6) > 0$$

$$(k+6)(k-2) > 0$$

critical value

$$k+6=0$$

$$k = -6$$

$$\text{and } k-2=0$$

$$\Rightarrow k=2$$

$$b^2 - 4ac > 0, \text{ only when } k < -6 \text{ and } k > 2,$$

So set of values of k are

$$k < -6, k > 2$$