Cambridge International AS & A Level

Mathematics 9709

Paper 1 Pure Mathematics 1

Topic 7-Differentiation

Question No (1)

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A curve has equation $y = \frac{k}{x}$. Given that the gradient of the curve is -3 when $x = 2$, find the value of the constant k.

Solution

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Equation of curve

$$y = \frac{k}{x}$$

$$y = k x^{-1}$$

Differentiating w.r.t x

$$\frac{dy}{dx} = k\left[-1\, x^{-1-1}\right]$$

$$= -k x^{-2}$$

$$\frac{dy}{dx} = -\frac{k}{x^2} \longrightarrow (1)$$

As gradient is -3 as given in Q

$$\Rightarrow \frac{dy}{dx} = -3$$

So equation (1) will become

$$-3 = \frac{-k}{x^2}$$

at $x = 2$

$$-3 = \frac{-k}{(2)^2}$$

$$-3 = -\frac{k}{4}$$

$$k = 12$$