Banker Short Question: No. 3

The graph of $y = g(x)$ passes through the point (1, 2).

If $\frac{dy}{dx} = x^3 + \frac{1}{x^2} - \frac{1}{4}$ express y in terms of x. **(4)**

[Scroll to next page to see solution]

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Solution.

Integrate:

$$y = \int x^3 + \frac{1}{x^2} - \frac{1}{4}\ dx$$

Put into straight line form first:

$$y = \int x^3 + x^{-2} - \frac{1}{4}\ dx$$

$$y = \frac{x^4}{4} + \frac{x^{-1}}{-1} - \frac{1}{4}x + C$$

Simplify

$$y = \frac{1}{4}x^4 - \frac{1}{x} - \frac{1}{4}x + C$$

Use the given point (1, 2) to find the value of C

$y = 2$, when $x = 1$

$$2 = \frac{1}{4}(1)^4 - \frac{1}{(1)} - \frac{1}{4}(1) + C$$

$$2 = \frac{1}{4} - 1 - \frac{1}{4} + C$$

$$2 = -1 + C$$

Hence $C = 3$

So

$$y = \frac{1}{4}x^4 - \frac{1}{x} - \frac{1}{4}x + 3$$

Notes on solution

This is a differential equation.

To solve it – integrate.

Straight line form is essential.

Indefinite integral.

Do not forget **CONSTANT C** of integration.

This is an infinite set of curves. Any value of C will give you the same expression for $\frac{dy}{dx}$

Use the point that the curve passes through to evaluate the constant C.

Stae your answer with the found value of C replaced.