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JC MATHEMATICS (H2) STUDY TIPS

HOW TO RUN INTEGRATION BY
PARTS WHEN ONLY ONE
COMPONENT IS PRESENT

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JC_H2Maths_031



• Letting $dv/dx=1$

Example 27

Find $\int \sin^{-1} x \, dx$.

L I A T E

$\uparrow$ $\uparrow$
 $u = \sin^{-1} x$ $\frac{dv}{dx} = 1$
 $\frac{du}{dx} = \frac{1}{\sqrt{1-x^2}}$ $v = x$

$$= \int (1) \sin^{-1} x \, dx \quad \rightarrow -\frac{1}{2} \int \frac{-2x}{\sqrt{1-x^2}} \, dx$$

$$= x \sin^{-1} x - \int \frac{x}{\sqrt{1-x^2}} \, dx$$

$$\int \frac{f'(x)}{\sqrt{f(x)}} \, dx = 2\sqrt{f(x)}$$

$$= x \sin^{-1} x + \frac{1}{2} (2\sqrt{1-x^2}) + C$$

$2\sqrt{f(x)}$

Quick Practice

Find $\int \tan^{-1} x \, dx$.

L I A T E

$\uparrow$ $\uparrow$
 $u = \tan^{-1} x$ $\frac{dv}{dx} = 1$
 $\frac{du}{dx} = \frac{1}{1+x^2}$ $v = x$

$$= x \tan^{-1} x - \int x \left(\frac{1}{1+x^2} \right) dx$$

$$= x \tan^{-1} x - \frac{1}{2} \int \frac{2x}{1+x^2} dx$$

$\leftarrow f'(x)$
 $\leftarrow f(x)$

$$= x \tan^{-1} x - \frac{1}{2} \ln |1+x^2| + C$$

$\ln |f(x)|$



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Explanation

When integrating a single function like an inverse trigonometric function using integration by parts, a clever technique is used to create a necessary second term.

The trick is to introduce an invisible factor of one into the expression, transforming it into a product of two terms.

According to the standard rule for choosing parts, this constant one is classified as an algebraic term, while the main function serves as the Inverse Trigonometric term.

By setting the derivative part equal to one, its integrated result simplifies to x , allowing the standard integration by parts formula to be successfully applied.

This method effectively converts a seemingly isolated expression into a straightforward, solvable problem.

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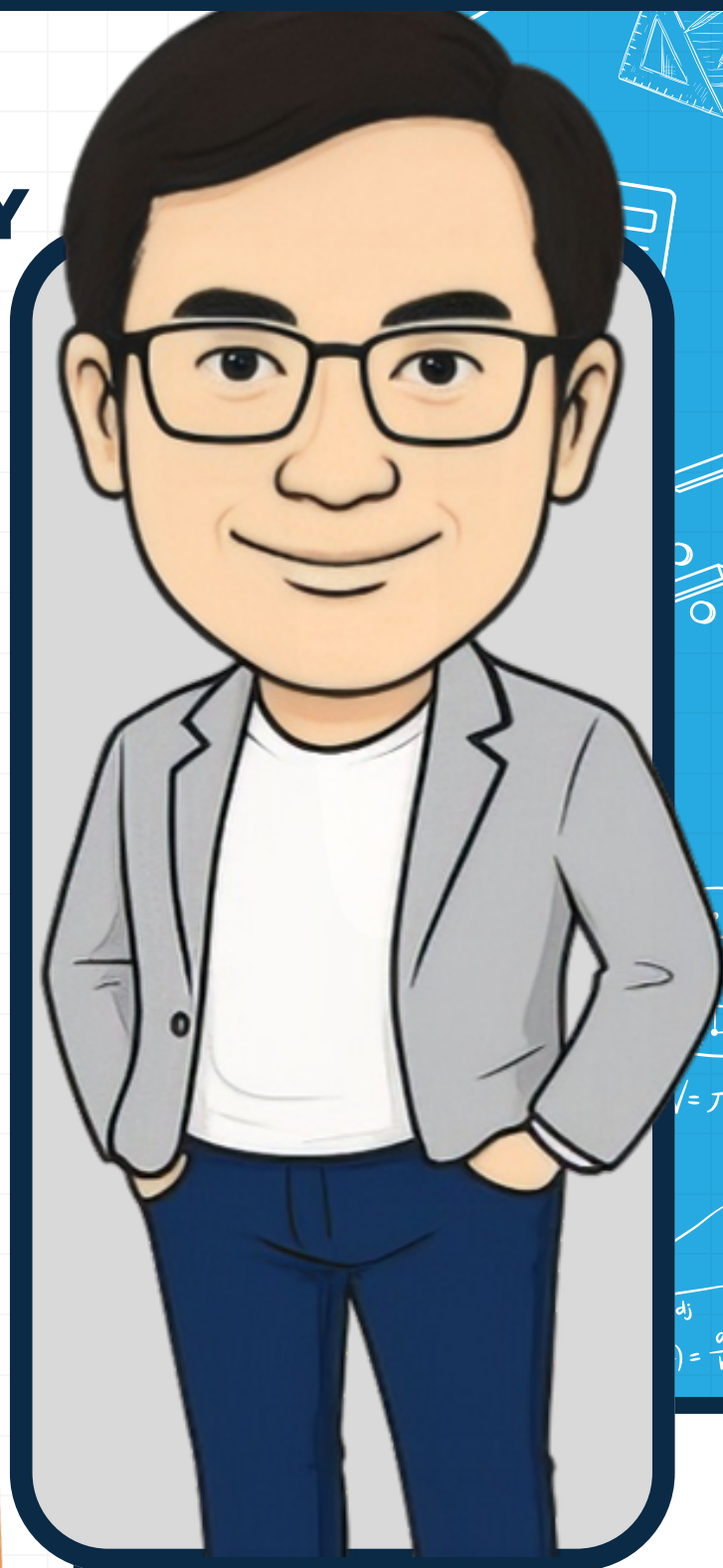
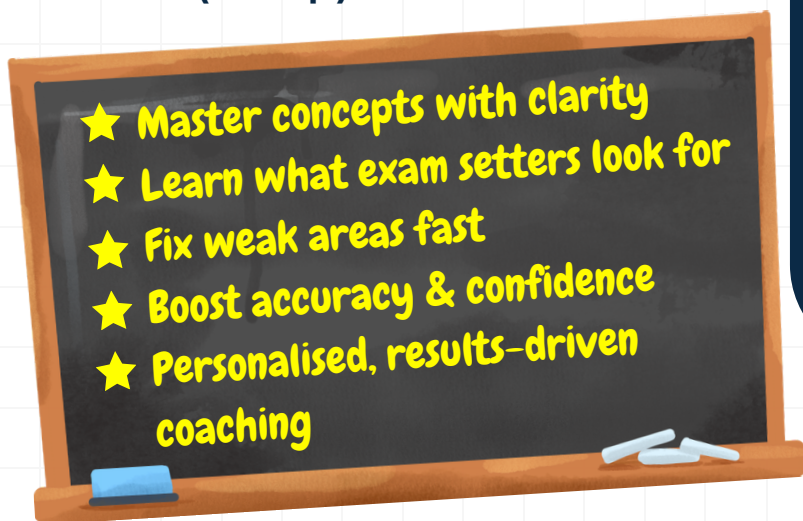
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