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JC MATHEMATICS (H2) STUDY TIPS

**SPOT THE KEYWORDS: LOOK
OUT FOR "NUMERICAL VALUE"
AS YOUR GREEN LIGHT TO USE
THE GC**

PREPARED BY
Mr Jackie Lee



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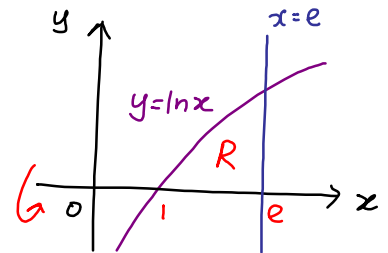
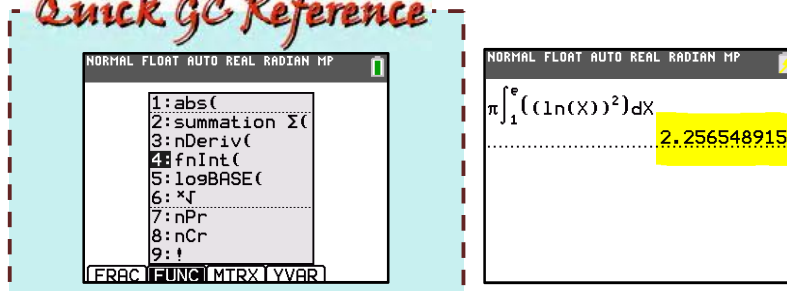


16. Finding the Numerical Value of Area / Volume

Example 35

Use GC The region R is bounded by the curve $y = \ln x$, the line $x = e$ and the x -axis. Find the numerical value of the volume of revolution formed when the region R is rotated completely about the x -axis, giving your answer correct to 3 decimal places.

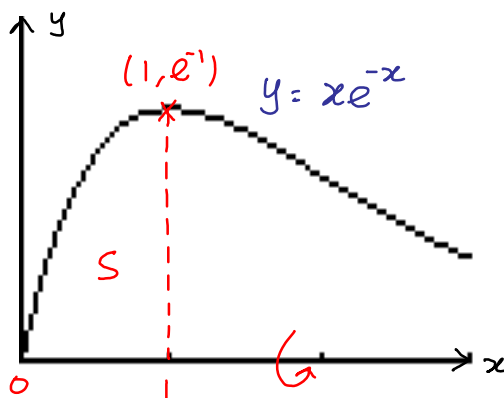
Quick GC Reference



Quick Practice

The region S is bounded by the curve $y = xe^{-x}$, the line $x = 1$ and the x -axis. Required Volume = $\pi \int_1^e y^2 dx = \pi \int_1^e (\ln x)^2 dx = 2.257 \text{ units}^3 \text{ (3dp)}$

- (i) Find the exact area of S . must DIY
 (ii) Find the numerical value of the volume of revolution formed when the region S is rotated completely about the x -axis, giving your answer correct to 3 decimal places.



(i) Required Area

$$= \int_0^1 xe^{-x} dx$$

$$= [-xe^{-x}]_0^1 - \int_0^1 (-e^{-x})(1) dx$$

$$= -(e^{-1} - 0) - [e^{-x}]_0^1$$

$$= -e^{-1} - (e^{-1} - e^0) = 1 - 2e^{-1} \text{ units}^2$$

L I A T E
 $u = x$
 $\frac{du}{dx} = 1$
 $\frac{dv}{dx} = e^{-x}$
 $v = -e^{-x}$

(ii) Required Volume

$$= \pi \int_0^1 x^2 e^{-2x} dx$$

$$= 0.254 \text{ units}^3 \text{ (3dp)}$$



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Explanation

When an exam question specifically asks to find the numerical value of an area or a volume of revolution, you do not need to evaluate the integration by hand using algebraic techniques.

Instead, your goal is to focus entirely on forming the correct definite integral expression as your first step, making sure to clearly state the integrand, variable, and lower/upper integration limits.

Once this expression is established on paper, immediately use the numerical integration feature (fnInt) on your Graphing Calculator (GC) to evaluate the final answer.

Always check for specific formatting and rounding instructions in the question prompt—such as expressing your final answer correct to 3 decimal places—to avoid unnecessary penalties on your final units.

This content is extracted from our lesson resources. Welcome to contact us for more tailor-made and in-depth learning.



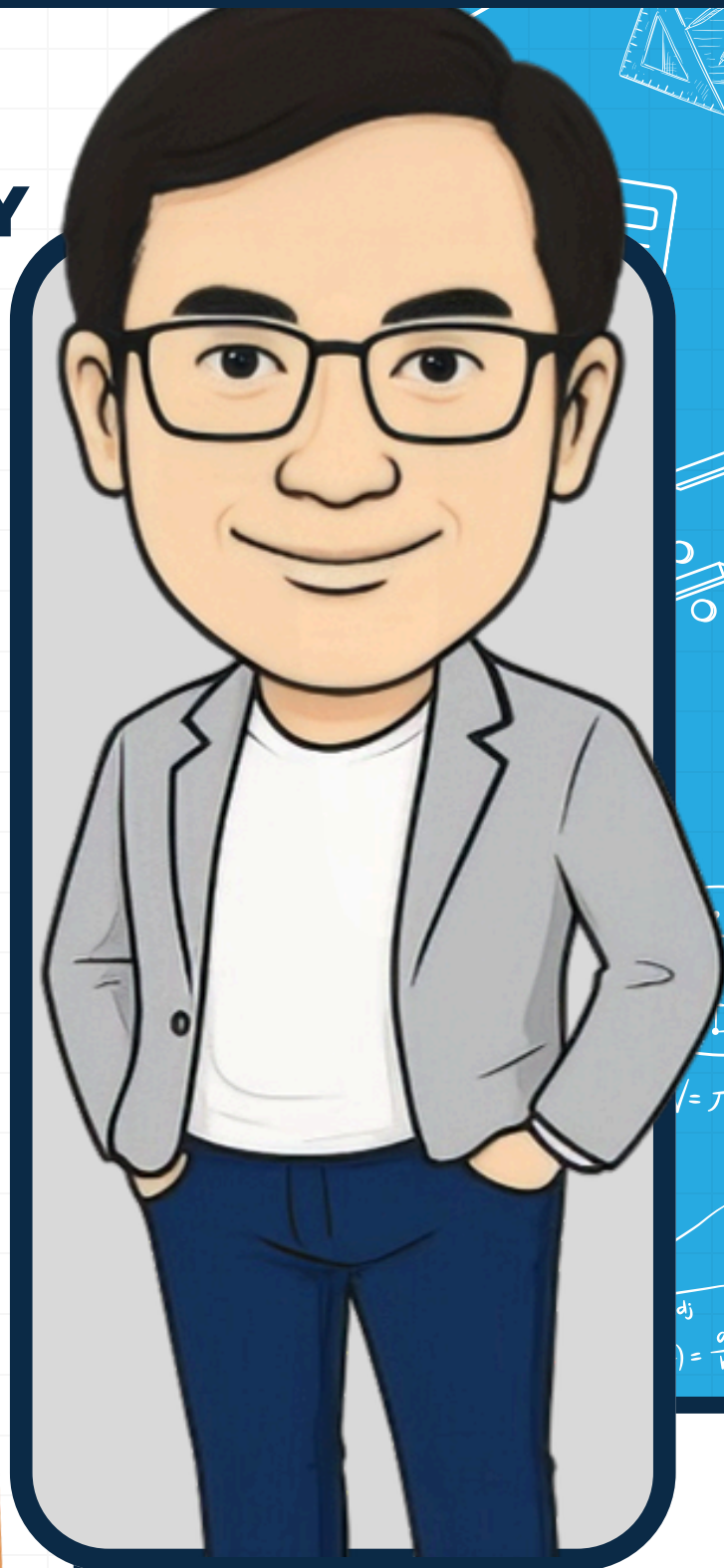
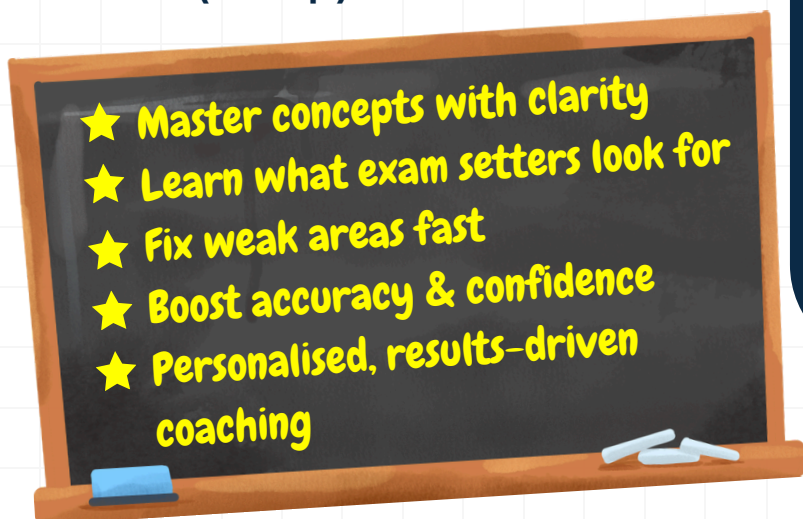
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- ✓ Winner of International Mathematics Competitions
- ✓ PGDE Qualification (NIE) with **Distinction in Mathematics**
- ✓ Former **School Maths Teacher** in
 - Nan Hua High School
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