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JC MATHEMATICS (H2) STUDY TIPS

**FAST-TRACK CALCULUS: TWO
POWERFUL SHORTCUTS IN
DIFFERENTIATION TECHNIQUES**

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www.h2maths.com

JC_H2Maths_028



Good to know

$$\frac{1}{x} = x^{-1} \xrightarrow{d} -x^{-2} = -\frac{1}{x^2}$$

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

$$\frac{d}{dx}\left(\frac{1}{f(x)}\right) = -\frac{f'(x)}{(f(x))^2}$$

Example 3

If $y = \frac{1}{3x-2}$, find $\frac{dy}{dx}$. $\therefore -\frac{3}{(3x-2)^2}$

$f(x) \rightarrow$ $\leftarrow f'(x)$
 $\leftarrow (f(x))^2$

Quick Practice

If $y = \frac{1}{2x^2+3}$, find $\frac{dy}{dx}$. $\therefore -\frac{4x}{(2x^2+3)^2}$

Good to know

$$\sqrt{x} = x^{\frac{1}{2}} \xrightarrow{d} \frac{1}{2}x^{-\frac{1}{2}} = \frac{1}{2\sqrt{x}}$$

$$\frac{d}{dx}(\sqrt{x}) = \frac{1}{2\sqrt{x}}$$

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

Example 4

If $y = \sqrt{2x+1}$, find $\frac{dy}{dx}$. $\therefore \frac{2}{2\sqrt{2x+1}}$

$f(x) \rightarrow$ $\leftarrow f'(x)$
 $\leftarrow 2\sqrt{f(x)}$

Quick Practice

If $y = \sqrt{x^2-1}$, find $\frac{dy}{dx}$. $\therefore \frac{2x}{2\sqrt{x^2-1}}$



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Explanation

To quickly differentiate a reciprocal function where one is divided by an inner expression, you can bypass the quotient rule by making the entire term negative, placing the derivative of that inner expression on top, and squaring the original expression on the bottom.

Similarly, for the square root shortcut, you can skip converting the root expression into a fractional exponent chain rule by setting up a fraction where the top is simply the derivative of whatever is inside the square root sign, and the bottom is exactly two times the original square root expression.

Both of these tricks save time by turning multi-step calculus workflows into immediate visual arrangements.

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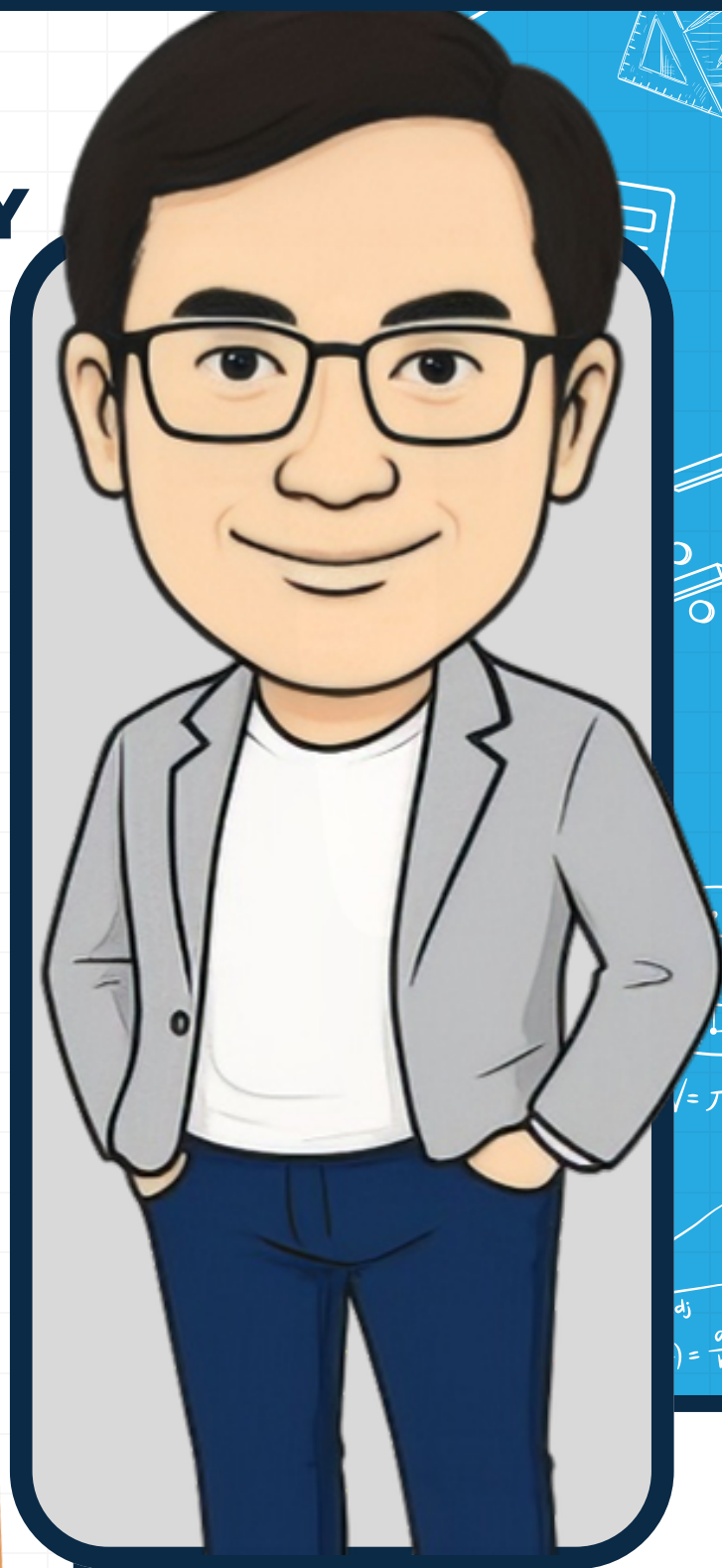
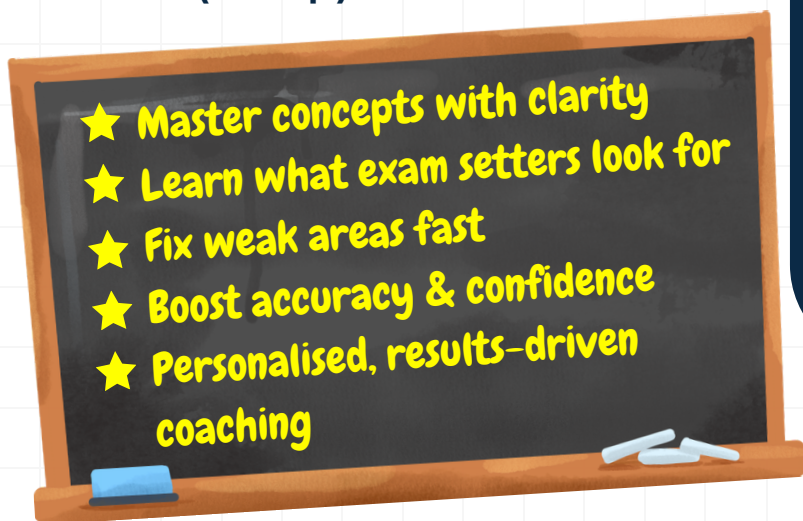
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