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JC MATHEMATICS (H2) STUDY TIPS

**MASTER THESE TWO
DIFFERENTIATION SHORTCUTS
AND STOP MAKING MISTAKES**

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JC_H2Maths_034



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

When dealing with differentiation, mastering these two shortcut strategies will completely transform how fast and accurately you find derivatives. The first tip applies to functions written as a reciprocal, meaning they feature a constant one on top of an expression. Instead of dragging yourself through the lengthy quotient rule or rewriting the term with negative exponents, you can instantly write down the answer by taking the derivative of the bottom expression, making it negative, and placing it over the original bottom expression squared.

The second tip handles square roots with a similar level of efficiency. You can completely bypass the chain rule by taking the derivative of whatever expression is sitting inside the square root symbol and putting it directly over two times the original square root. Relying on these direct mental pathways keeps your scratch work exceptionally clean and drastically lowers the risk of making silly algebraic blunders while rearranging powers.

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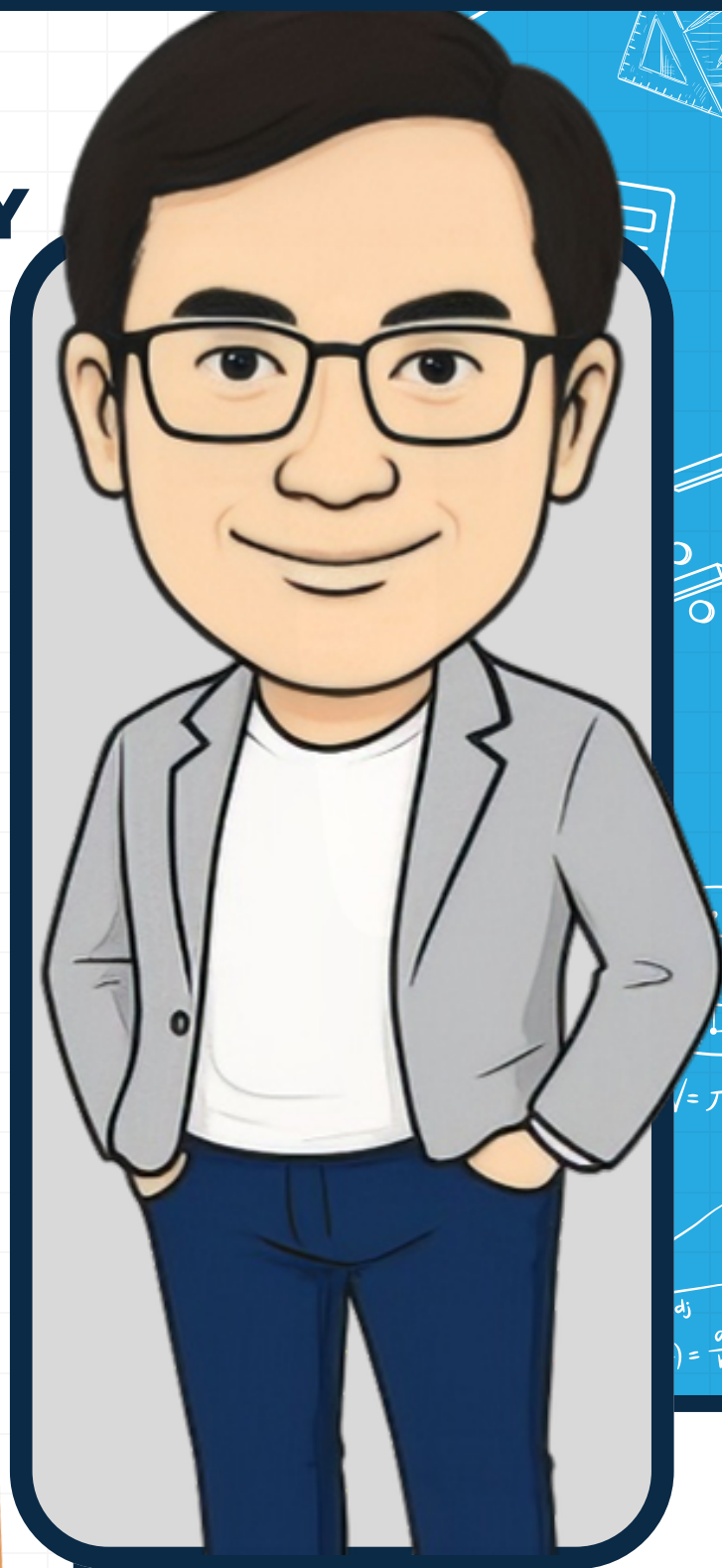
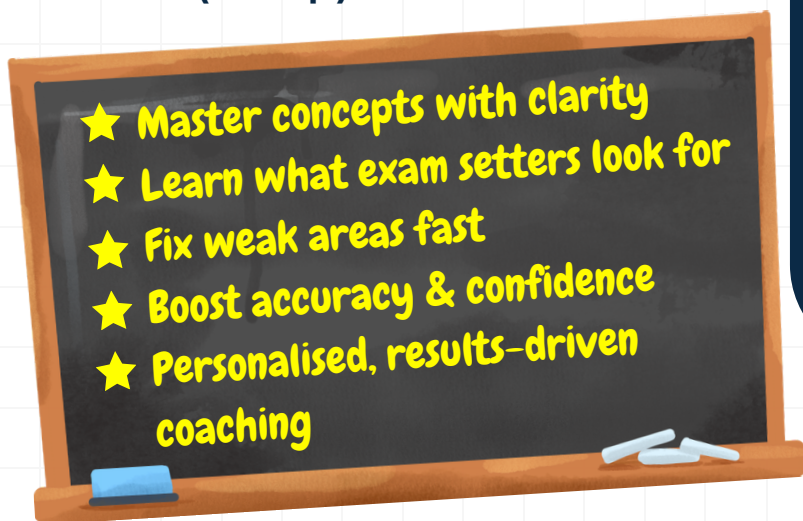
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