CM² Learning Center

Differentiation rules

Derivative

$$y' \qquad \frac{dy}{dx} \qquad f'(x)$$

Slope of the curve
Slope of the tangent line
Rate of change

Put power down, Power − 1

6.2	Derivative of x^n	$f(x) = x^n \implies f'(x) = nx^{n-1}$
	Derivative of $\sin x$	$f(x) = \sin x \implies f'(x) = \cos x$
	Derivative of $\cos x$	$f(x) = \cos x \implies f'(x) = -\sin x$
	Derivative of $\tan x$	$f(x) = \tan x \implies f'(x) = \dfrac{1}{\cos^2 x}$
	Derivative of e^x	$f(x) = e^x \implies f'(x) = e^x$
	Derivative of $\ln x$	$f(x) = \ln x \implies f'(x) = \dfrac{1}{x}$
	Chain rule	$y = g(u),\ u = f(x) \implies \dfrac{dy}{dx} = \dfrac{dy}{du} \times \dfrac{du}{dx}$
	Product rule	$y = uv \implies \dfrac{dy}{dx} = u\dfrac{dv}{dx} + v\dfrac{du}{dx}$
	Quotient rule	$y = \dfrac{u}{v} \implies \dfrac{dy}{dx} = \dfrac{v\dfrac{du}{dx} - u\dfrac{dv}{dx}}{v^2}$

Simple differentiation

Find the derivative of the following functions.

1. $y = 4x$

2. $y = 5x^3$

3. $y = 10\sqrt{x}$

4. $y = 20$

5. $y = \dfrac{9}{x^3}$

6. $y = 5x^3 + 4x - 29$

7. $y = 2(3x - 2)$

8. $y = \dfrac{4}{3}x^6 + 5x^2 + 2x$

9. $y = \dfrac{1}{3x^3} - 2x^2 - 5$

Find the gradient of the curve

1. $y = 10x^3$ at $x = 2$

2. $y = 4x^2 - 5x + 2$ at $x = 1$

3. $y = \dfrac{3}{x^3} - 2x$ at $x = 3$

4. $y = \dfrac{3}{\sqrt{x}} - 2x$ at $x = 2$

5. $y = (x + 3)^3$ at $x = -2$

Chain rule

Find y' of the following functions

1. $y = (5x - 2)^3$

2. $y = 6(x^2 + 3x - 4)^2$

3. $y = \dfrac{5}{4x - x^2}$

4. $y = \dfrac{8}{(9x+3)^2}$

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5. $y = \sqrt{x^2 + 3}$

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Paper 1

1. $\quad$ Consider $f(x) = x^2 \sin x$.

(a) Find $f'(x)$.

(b) Find the gradient of the curve of f at $x = \dfrac{\pi}{2}$.

2. 🔲 Given that $f(x) = \dfrac{1}{x}$, answer the following.

(a) Find the first four derivatives of $f(x)$.

(b) Write an expression for $f^{(n)}(x)$ in terms of x and n.