

$$1 \quad (1) \quad f(x) = x^3 \rightarrow f'(x) = 3x^{3-1} = 3x^2$$

$$(2) \quad f(x) = 4x^2 - 8x \rightarrow f'(x) = (4x^2)' - (8x)' = 4 \times 2x - 8 \times 1 = 8x - 8 \\ = 8(x-1)$$

$$(3) \quad f'(x) = (5x^3 - 10)' = 15x^2$$

$$(4) \quad f(x) = \frac{2}{x^3} = 2x^{-3}$$

$$f'(x) = 2 \times (-3) x^{-3-1} \\ = -6x^{-4} = -\frac{6}{x^4}$$

$$(5) \quad f'(t) = (5t^3 - 8t - 10)' \\ = 15t^2 - 8$$

$$2 \quad (1) \quad f'(x) = (x+1)'(3x^2-2) + (x+1)(3x^2-2)' \\ = 1 \cdot (3x^2-2) + (x+1)6x \\ = 3x^2 - 2 + 6x^2 + 6x \\ = 9x^2 + 6x - 2$$

$$(2) \quad f'(x) = (x^4 + 5x)'(2x^2 - 5x) \\ + (x^4 + 5x)(2x^2 - 5x)' \\ = (4x^3 + 5)(2x^2 - 5x) + (x^4 + 5x)(4x - 5) \\ = (8x^5 - 20x^4 + 10x^2 - 25x) \\ + (4x^5 - 5x^4 + 20x^2 - 25x)$$

$$= 12x^5 - 25x^4 + 30x^2 - 50x$$

$$\begin{aligned} 3(1) \quad y' &= \frac{(x^2)'(x^3-1) - x^2(x^3-1)'}{(x^3-1)^2} \\ &= \frac{2x(x^3-1) - x^2 \times 3x^2}{(x^3-1)^2} \\ &= \frac{2x^4 - 2x - 2x^4}{(x^3-1)^2} = -\frac{2x}{(x^3-1)^2} \end{aligned}$$

$$\begin{aligned} (2) \quad y' &= \left(\frac{5}{x^4-x} \right)' = \frac{5'(x^4-x) - 5(x^4-x)'}{(x^4-x)^2} \\ &= \frac{0 \times (x^4-x) - 5(4x^3-1)}{(x^4-x)^2} \\ &= \frac{-20x^3 + 5}{(x^4-x)^2} = -\frac{5(4x^3-1)}{(x^4-x)} \end{aligned}$$

$$\begin{aligned} (3) \quad y' &= \left(\frac{5x}{x^4-x} \right)' = \frac{(5x)'(x^4-x) - 5x(x^4-x)'}{(x^4-x)^2} \\ &= \frac{5(x^4-x) - 5x(4x^3-1)}{(x^4-x)^2} \\ &= \frac{5x^4 - 5x - 20x^4 + 5x}{(x^4-x)^2} \\ &= -\frac{15x^4}{(x^4-x)^2} \end{aligned}$$

4 (1) $u = (x^2 + 2)$ とおくと, $y = u^2$ であるため,

$$\frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx} = 2u \times 2x = 2(x^2 + 2) \times 2x = 4x(x^2 + 2)$$

(2) $u = (x^3 + 2x)$ とおくと, $y = \frac{1}{u^2}$ であるため,

$$\frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx} = -\frac{2}{u^3} \times (3x^2 + 2) = -\frac{2(3x^2 + 2)}{(x^3 + 2x)^3}$$

$$\frac{dy}{du} = (u^{-2})' = -2u^{-3} = -\frac{2}{u^3}, \quad \frac{du}{dx} = (x^3 + 2x)' = 3x^2 + 2$$

(3) $y = \sqrt{(2x+7)} = (2x+7)^{\frac{1}{2}}$

$u = (2x+7)$ とおくと, $y = u^{\frac{1}{2}}$ であるため,

$$\frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx} = \frac{1}{2} u^{-\frac{1}{2}} \times 2 = u^{-\frac{1}{2}} = (2x+7)^{-\frac{1}{2}} = \frac{1}{\sqrt{2x+7}}$$

(4) $y = \sqrt[3]{(2x+7)^4} = \{(2x+7)^4\}^{\frac{1}{3}} = (2x+7)^{\frac{4}{3}}$

$u = (2x+7)$ とおくと, $y = u^{\frac{4}{3}}$

$$\frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx} = \frac{4}{3} u^{\frac{4}{3}-1} \times 2 = \frac{4}{3} u^{\frac{1}{3}} \times 2 = \frac{4}{3} (2x+7)^{\frac{1}{3}} \times 2 = \frac{8}{3} \sqrt[3]{2x+7}$$