

1) ①

$$1. y = 2x^3 + x^2 + x^{-2}$$

$$\frac{dy}{dx} = 6x^2 + 2x - 2x^{-3}$$

$$= \boxed{6x^2 + 2x - \frac{2}{x^3}}$$

$$2. y = 2x^{\frac{1}{2}} + 2x^{-2}$$

$$\frac{dy}{dx} = \frac{1}{2} 2x^{-\frac{1}{2}} - 2(2x^{-3})$$

$$= x^{-\frac{1}{2}} - 4x^{-3}$$

$$= \boxed{\frac{1}{\sqrt{x}} - \frac{4}{x^3}}$$

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

$$\frac{dy}{dx} = (x^3 - 1)(2) + (2x + 1)(3x^2)$$

$$= \boxed{2(x^3 - 1) + 3x^2(2x + 1)}$$

$$4. y = \frac{3x + 2}{x^2 - 3}$$

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

$$= \frac{3x^2 - 9 - 6x^2 - 4x}{(x^2 - 3)^2}$$

$$= \boxed{\frac{-3x^2 - 4x - 9}{(x^2 - 3)^2}}$$

$$5. y = (3x + 5)^3$$

$$\frac{dy}{dx} = 3(3x + 5)^2 \cdot 3$$

$$= \boxed{9(3x + 5)^2}$$

$$6. y = 2x(2x + 5)^3$$

$$\frac{dy}{dx} = 2x(3(2x + 5)^2 \cdot 2) + (2x + 5)^3(2)$$

$$= 4$$

$$= 12x(2x + 5)^2 + 2(2x + 5)^3$$

$$= 2(2x + 5)^2 [6x(1) + (2x + 5)]$$

$$= \boxed{2(2x + 5)^2(8x + 5)}$$

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$$f(x+h) = (x+h)^2 - 2(x+h) = x^2 + 2xh + h^2 - 2x - 2$$

$$f(x) = x^2 - 2x$$

$$f(x+h) - f(x) = 2xh + h^2 - 2h$$

$$\frac{f(x+h) - f(x)}{h} = 2x + h - 2$$

$$\lim_{h \rightarrow 0} (2x + h - 2) = \boxed{2x - 2}$$