

$$1) \quad \frac{d}{dx} f(x) = g(x) \quad h(x) = 4x^3$$

$$\frac{d}{dx} f(h(x)) \rightarrow f'(h(x)) h'(x)$$

$$= g(4x^3) \cdot 12x^2$$

$$2) \quad \lim_{h \rightarrow 0} \frac{\sin\left(\frac{2\pi}{3} + h\right) - \sin\left(\frac{2\pi}{3}\right)}{h}$$

The derivative of $f(x) = \sin(x)$ when $x = \frac{2\pi}{3}$

$$f'(x) = \cos x$$

$$f'\left(\frac{2\pi}{3}\right) = \cos\left(\frac{2\pi}{3}\right) = -\frac{1}{2}$$

$$3) \quad \lim_{h \rightarrow 0} \frac{\tan\left(\frac{\pi}{4} + h\right) - 1}{h}$$

$$\frac{4}{2} = \boxed{2}$$

$$f(x) = \tan x$$

$$f'(x) = \sec^2 x$$

$$f'\left(\frac{\pi}{4}\right) = \sec^2\left(\frac{\pi}{4}\right) = \left(\frac{2}{\sqrt{2}}\right)^2 \uparrow$$