

1 | $A|B|_0^3 \Rightarrow f'(x) = m = \frac{\Delta y}{\Delta x} = \frac{f}{x}$ ✓

(۲)

۲ | $P|q|_1^2 \Rightarrow y = \frac{x+f}{\sqrt{ax+1}} \Rightarrow \sqrt{ax+1} = \frac{x+f}{\sqrt{ax+1}} \Rightarrow x^2+ax+1 = ax^2-9$
 $x^2+(1-9a)x+10=0$ $\Delta=0 \Rightarrow (1-9a)^2-40=0$
 $\Rightarrow 1-9a = \pm 2 \Rightarrow a \in \mathbb{R}^+ \Rightarrow a=2 \Rightarrow f(x) = \sqrt{2x-1}$ (۲)
 $\Rightarrow f(9) = \sqrt{17} = 3$ ✓

۳ | $y = \frac{m}{x} + \frac{n}{x} \Rightarrow f(x) = \frac{(x+m)(x+n) - (x^2+mx+1)}{(x+n)^2}$
 $f'(1) = \frac{m+n-1}{(1+n)^2} = \frac{m+n-1}{4} \Rightarrow m+n=5 \Rightarrow m=2 \Rightarrow f(x) = \frac{x^2+2x+1}{x+2}$ (۲)
 $\Rightarrow f(1) = \frac{1}{2} + \frac{1}{1} = \frac{1+2+1}{2} = 1 \Rightarrow n=1 \Rightarrow m+n=3$ ✓

۴ | $f(x) = \frac{(x-\sin x)(\sin^2 x + 3\sin x + 9)}{x^2 - \sin^2 x} \Rightarrow g(x) = f(x) = \frac{9 - \sin^2 x - 3\sin x}{x + \sin x}$
 $= \frac{-\sin x(\sin x + 3)}{\sin x + x} = -\sin x \Rightarrow g'(x) - f'(x) = -\cos x \Rightarrow x = \frac{\omega\pi}{2}$ (۲)
 $= -\cos \frac{\omega\pi}{2} = -\frac{1}{2}$ ✓

۵ | $\sqrt{x} > 0 \Rightarrow g(x) = \frac{1}{\sqrt{x}} \Rightarrow g(\sqrt{x}) = \frac{1}{x} > 0 \Rightarrow f(x) = \frac{1}{\sqrt{x}}$
 $\Rightarrow f \circ g(x) = \frac{1}{\sqrt{\frac{1}{x}}} = -x \Rightarrow (f \circ g)'(x) = -1$ (۲) ✓

$$g(x) = \frac{f(x)-1}{x} \Rightarrow \lim_{x \rightarrow 0} g(x) \Rightarrow \frac{0}{0} \Rightarrow f'(0) = ?$$

$$f(x) = \sqrt{\frac{\cos x (\sin 2x) - (\cos x)(\sin x - 1)}{(1 + \sin x)^2}} \quad (2)$$

$$f'(0) = \sqrt{\frac{(\cos 0)(2)}{(1 + \sin 0)^2}} \cdot \left(\frac{-1 + \sin 0}{1 + \sin 0} \right) = \sqrt{2} \cdot \frac{-1}{2} = -\frac{\sqrt{2}}{2}$$

$$f(x) = -x^2 - 1 \Rightarrow f'(x) = -2x \Rightarrow x_1 = -x_2 = t \Rightarrow f'(t) = -\frac{1}{f'(t)}$$

$$\Rightarrow -2t = \frac{-1}{-2t} \Rightarrow 4t^2 = 1 \Rightarrow t = \pm \frac{1}{2} \Rightarrow f\left(\frac{1}{2}\right) = -\frac{\omega}{2} \quad (2)$$

$$d \Rightarrow y = k \Rightarrow k = \frac{\omega}{2} \Rightarrow |m| \cdot |k| = \sqrt{0 + \frac{\omega^2}{4}} = \frac{\omega}{2} = 1, \frac{\omega}{2}$$

$$f'(x) = 2 \cdot 2\sqrt{x} - \frac{2}{\sqrt{x}} \Rightarrow \text{نقطة} \Rightarrow \frac{\Delta y}{\Delta x} = \frac{f(x) - f(x_0)}{x - x_0} \Rightarrow$$

$$\frac{2\sqrt{x} - \frac{2}{\sqrt{x}}}{x - x_0} = 2\sqrt{x_0} - \frac{2}{\sqrt{x_0}} \Rightarrow 1 \cdot \frac{x - x_0}{x - x_0} + \frac{2}{\sqrt{x_0}} = 2\sqrt{x_0} - \frac{2}{\sqrt{x_0}} \quad (2)$$

$$2\sqrt{x} = 2\sqrt{x_0} \Rightarrow \sqrt{x} = \sqrt{x_0} \Rightarrow x = x_0 \Rightarrow \boxed{x = \frac{1}{2}} \quad f'\left(\frac{1}{2}\right) = 2 \cdot \frac{1}{\sqrt{2}} - \frac{2}{\sqrt{2}}$$

$$\boxed{f \wedge \sqrt{2}} \quad \checkmark$$

$$f'(x) = \frac{\left(\frac{1}{\sqrt{x}}\right)(-5(x+1)) - (-5x+1)(\sqrt{x})}{(-5x^2+x+1)^2} = \frac{4x^2 - x + 1}{\sqrt{x}(-5x^2+x+1)^2} = \frac{\sqrt{x}}{(-5x^2+x+1)\sqrt{x}}$$

$$\Rightarrow 4x^2 - x + 1 = -5x^2 + x + 1 \Rightarrow 1 - x^2 - 2x = 1 \Rightarrow \boxed{x = \frac{1}{2}} \quad \text{نقطة}$$

$$f\left(\frac{1}{2}\right) = \frac{1}{\sqrt{\frac{1}{2}}} = \sqrt{2} \quad \checkmark \quad (2)$$

$$\lim_{x \rightarrow \frac{\omega}{2}} g(x) = \frac{1}{\frac{\omega}{2}} = \frac{2}{\omega} \Rightarrow f \circ g = \left(\frac{2}{\sqrt{2x-1}}\right)^2$$

$$\Rightarrow (f \circ g)'(x) = \frac{-2 \cdot \frac{2}{\omega} \cdot \frac{1}{\omega}}{\left(\frac{2}{\omega}\right)^2} \Rightarrow f \circ g\left(\frac{\omega}{2}\right) = \frac{-4 \cdot \frac{1}{\omega}}{\frac{4}{\omega^2}} \Rightarrow \frac{-4 \cdot \frac{1}{\omega} \cdot \omega^2}{4} = -\omega$$

$$\boxed{f \circ g} \quad \checkmark \quad (2)$$