Subject :
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① $g'(x) = f'(\tan^2 x + \sqrt{2}\cos x) \times 2\tan x (1+\tan^2 x) \times -\sqrt{2}\sin x$

$g'(\frac{\pi}{4}) = \sqrt{2} = f'(2) \times 2 \times 2 \times (-1) \rightsquigarrow \boxed{f'(2) = -\frac{\sqrt{2}}{4}}$

② $f'(\frac{7\pi}{4}) - 2g'(\frac{7\pi}{4}) = ?$ $\rightarrow -\cos x$ مشتق $\sin x$ $\quad \sin(\frac{7\pi}{4}) = \boxed{\frac{1}{2}}$ جواب

$f(x) - 2g(x) = \frac{(2+\cos x)(\cos^2 x - 2\cos x + 4)}{(2-\cos x)(2+\cos x)} - \frac{4}{2-\cos x} = \frac{\cos x(\cos x - 2)}{2-\cos x} = -\cos x$

③ $\frac{2\sqrt{4}}{2} = \sqrt{4} = f'_+(\frac{\pi}{4})$ چون قدرمطلق است، مشتق چپ و راست برابر هستند پس:

$(4x-c)\sqrt{ax} \xrightarrow{\text{مشتق}} 4\sqrt{ax} + \frac{a}{2\sqrt{ax}} \times (4x-3) = \sqrt{4} \rightarrow 4\sqrt{\frac{\pi}{4}a} = \sqrt{4}$

$\frac{16}{\pi} \times \frac{\pi}{4} a = 4$

$\Rightarrow \boxed{a = \frac{1}{2}}$

④ $f(\varepsilon) = -4a + 2 \quad f'(\varepsilon) = -a \Rightarrow -2a + 2 = -1 \quad a = \frac{3}{2}$

$\rightarrow \boxed{f'(\varepsilon) = -\frac{3}{2}}$

⑤ $m = \frac{1}{7} \quad / \quad y' = \frac{a+3}{(2x+1)^2} = \frac{1}{7}$

$y = \frac{x+a}{7} \qquad \frac{ax-1}{2x+1} = \frac{x+a}{7} \Rightarrow 7ax - 7 = 2x^2 + 14x + a$

$0 = 2x^2 + (14 - 7a)x + 12$

$\rightarrow \Delta = 0 \rightarrow (14-7a)^2 = 144 \rightsquigarrow 14 - 7a = \begin{cases} 12 \rightarrow a = \frac{2}{7} \\ -12 \rightarrow a = 4 \end{cases}$

حذف $a = \frac{2}{7}$ در تست $\Longrightarrow 2x^2 + 12x + 12 = 0$

$2(x+2)^2 = 0 \quad x = -2$ غیرقابل قبول $\quad / \quad \boxed{a = 4}$

⑥ $f(2) = 0 \Rightarrow a = 8 + 2a - b \quad / \quad f'(x) = 2x^2 + a \rightsquigarrow \boxed{a = -12}$

$b = 8 - 24$

$\boxed{b = -16} \qquad b - a = -16 + 12 = \boxed{-4}$

$\cos ax \to 1 - \frac{a^2x^2}{2}$

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(۷) $f(x) = n \sin x^2 \times \cos x^2 \times 2x$

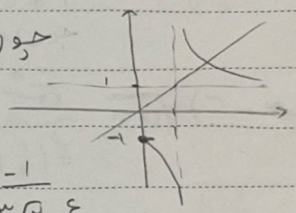
$$\lim_{x\to 0} \frac{\sin^n x^2 \cdot n \sin x^2 \cdot \cos x^2 \cdot 2x}{(1-\cos x)^m} \overset{\text{هم‌ارز}}{\Longrightarrow} \frac{x^{2n} \cdot n x^2 \left(1 - \frac{x^2}{2}\right) \cdot 2x \times 2^m}{x^{2m}} = 2\sqrt{2}$$

$$\Rightarrow \frac{2^m \times 2n\, x^{2n+2}}{x^{2m}} = 2^{\frac{11}{2}} \to 2n+2 = 2m \;/\; 2^m \times 2n = 2^{\frac{11}{2}}$$

$2n = 2m-2$ ، $2^m \times 4 = 2^{\frac{11}{2}}$ ، $m = \frac{7}{2}$ و $n = 2$

$2m+n = 9$ جواب

(۸) $f'(x) = (f^{-1})'(x)$? چون $a+d=0$ پس وارون تابع با خود تابع برابر است



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

$$\Rightarrow \frac{4+3\sqrt{2}}{-2} = \left(-2 - \frac{3}{2}\sqrt{2}\right)$$ جواب

(۹) $\frac{f(0)-f(-1)}{1} = 1 - 8(1-a) = -11 \rightsquigarrow 1 - 8 + 8a = -11 \rightsquigarrow a = -\frac{1}{2}$

$$f'(1) \Rightarrow 3(x^2+1)^2 (2x)\left(-\frac{1}{2}x+1\right) + \left(-\frac{1}{2}\right)(x^2+1)^3 = 4 - 5 = \boxed{-1}$$ جواب

(۱۰) $\frac{f(\frac{\pi}{2}) - f(\frac{\pi}{4})}{g(\frac{\pi}{2}) - g(\frac{\pi}{4})} = ?$

$$\Rightarrow \frac{\sin\frac{\pi}{2}\cdot\cos\pi - \sin\frac{\pi}{4}\cdot\cos\frac{\pi}{2}}{\left(\sin^4\frac{\pi}{2} - \cos^4\frac{\pi}{2}\right)\left(\sin^4\frac{\pi}{4} - \cos^4\frac{\pi}{4}\right)} = \boxed{-1}$$ جواب

($\sin\frac{\pi}{2} = 1$، $\cos\pi = -1$، $\sin\frac{\pi}{4} = \cos\frac{\pi}{4}$)