پویا فلاطیان

بنام خدا

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۲۰ آفرین

۱)

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

$$g'(\tfrac{\pi}{4}) = f'(2) \times (4 + (-\sqrt{2}) \times \tfrac{\sqrt{2}}{2}) = 3f'(2) = \sqrt{3} \rightarrow \boxed{f'(2) = \tfrac{\sqrt{3}}{3}}$$

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۲)

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

$$\rightarrow f(x) - 2g(x) = \frac{\cos^2 x - 2\cos x}{2-\cos x} = \frac{\cos x(\cos x - 2)}{2-\cos x} = -\cos x \rightarrow (f(x)-2g(x))' =$$

$$f'(x) - 2g'(x) = \sin x \rightarrow f'(\tfrac{7\pi}{6}) - 2g'(\tfrac{7\pi}{6}) = \boxed{\tfrac{-1}{2}}$$

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۳)

$$\lim_{x \to (\frac{3}{4})^+} \frac{4(x-\frac{3}{4})\sqrt{ax} - 0}{x - \frac{3}{4}} = 4\sqrt{ax} = \frac{4 \times \sqrt{3a}}{2} = 2\sqrt{3a}$$

$$\lim_{x \to (\frac{3}{4})^-} \frac{-4(x-\frac{3}{4})\sqrt{ax} - 0}{x - \frac{3}{4}} = -4\sqrt{ax} = -\frac{4 \times \sqrt{3a}}{2} = -2\sqrt{3a}$$

$$\Rightarrow 4\sqrt{3a} = 2\sqrt{6} \rightarrow 48a = 24 \rightarrow \boxed{a = \tfrac{1}{2}}$$

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۴)

$$y = 2 - ax \rightarrow f(4) = 2 - 4a \;,\; f'(4) = -a \rightarrow f(4) + f'(4) = 2 - 5a = -1 \rightarrow a = \tfrac{3}{5}$$

$$\rightarrow f'(4) = -a = \boxed{\tfrac{-3}{5}}$$

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$y = \frac{1}{7}(x+5) \rightarrow$ شیب $= \frac{1}{7} \rightarrow \frac{a+3}{(3x+1)^2} = \frac{1}{7}$ (۱) $, \frac{1}{7}(x+5) = \frac{ax-1}{3x+1}$ (۲) $\rightarrow$

(۲) $\frac{1}{7}(3x^2+16x+5) = ax-1 \rightarrow \frac{1}{7x}(3x^2+16x+15) = a \rightarrow$ (۱) $\dfrac{\frac{1}{7x}(3x^2+16x+15)+3}{(3x+1)^2} = \frac{1}{7}$

$\rightarrow \frac{3x^2+37x+15}{7x(3x+1)^2} = \frac{1}{7} \rightarrow 9x^3+6x^2+x = 3x^2+37x+15 \rightarrow 9x^3+3x^2-36x-12=0$

$\rightarrow 3x^3+x^2-12x-4=0 \xrightarrow{x>0} x=2 \rightarrow \frac{a+3}{7\times7} = \frac{1}{7} \rightarrow \boxed{a=4}$

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(۶)

مماس بر محور x ها $\rightarrow 0 =$ شیب $\rightarrow f'(2) = 3x^2+a = 12+a = 0 \rightarrow \boxed{a=-12}$ $, f(2)=0 \rightarrow 8+2a-b=0$

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

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(۷)

$\lim_{x\to 0} \frac{f(x)\,f'(x)}{(1-\cos x)^m} = \cancel{\ldots}$

$\frac{\sin^n(x^2) \times n\sin^{n-1}(x^2)\times 2x\times \cos x^2}{(1-\cos x)^m} = \frac{n\,x^{2n}\times x^{2n-2}\times 2x}{(\frac{x^2}{2})^m} = \frac{2n\,x^{4n-1}\times 2^m}{x^{2m}} \rightarrow$

$n2^{m+1} \times x^{4n-1-2m} = 2^{\frac{11}{2}} \rightarrow 4n-1=2m \rightarrow \frac{2m+1}{4}\times 2^{m+1} = 2^{\frac{11}{2}} \rightarrow \boxed{m=\frac{7}{2}} \rightarrow \boxed{n=2}$

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$\rightarrow 2m+n = 7+2 = \boxed{9}$

(۸)

$y = \frac{\sqrt{x}+1}{\sqrt{x}-1} \rightarrow \frac{y+1}{y-1} = \sqrt{x} \rightarrow x = (\frac{y+1}{y-1})^2 \rightarrow y = (\frac{x+1}{x-1})^2 \rightarrow f^{-1\prime}(2) =$

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$2(\frac{3}{1}) \times \frac{-2}{1} = \boxed{-12}$

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$f(-1) = 8(-a+1)\ ,\ f(0) = 1 \rightarrow \frac{1+8a-8}{1} = 8a-7 = -11 \rightarrow \boxed{a = \frac{-1}{2}} \rightarrow x = -2a = 1$

$f'(\frac{1}{2}) = 3\times 4\times 2\times \frac{1}{2} + (\frac{-1}{2})(8) = 12-4 = \boxed{8}$

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(10)

$\sin\frac{\pi}{2}\times\cos\frac{\pi}{2} = 0\ ,\ \sin\frac{\pi}{2}\times\cos\pi = -1 \rightarrow \frac{-1}{\frac{\pi}{4}} = \frac{-4}{\pi}$

$y = \sin^2 x - \cos^2 x = -\cos 2x \rightarrow -\cos\frac{\pi}{2} = 0\ ,\ -\cos\pi = 1 \rightarrow \frac{1}{\frac{\pi}{4}} = \frac{4}{\pi}$

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$\frac{\frac{-4}{\pi}}{\frac{4}{\pi}} = \boxed{-1}$

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