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$\lim_{x\to 0^-} \frac{f'(x)}{x} = 2 \to \lim_{x\to 0^-} \frac{-6\sin(2x)\cos^2(2x) + 2ax}{x} = 2$

$\xrightarrow{\text{هم ارز}} \lim_{x\to 0^-} \frac{-6\times 2x + 2ax}{x} = 2$

1- $f'_{(0)} = 0 \,/\, f''_{(0)} = 2 \,/\, f' = (3)(2)(-\sin 2x)(\cos^2 2x) + 2ax$

$= f'' = 2a = 2 \Rightarrow (a=1) \rightarrow 0 = b + \cos^2 0 \,/\, f_{(0)} = 0 \Rightarrow b = -1$ ✓ (1)

$\to \lim \frac{(2a-12)x}{x} = 2 \to 2a - 12 = 2 \to a = 7$ $a+b=6$ $a+b=0$

2- $y' = 2x \,/\,$ نقاط: $x_1, -x_1 \,/\, 2x_1 \times (-2x_1) = -1 \Rightarrow x_1 = \pm\frac{1}{2} \Rightarrow$

$f_{(\frac{1}{2})} = -\frac{3}{4} \,/\, f_{(-\frac{1}{2})} = -\frac{3}{4} \Rightarrow f_{(\frac{1}{2})} + f_{(-\frac{1}{2})} = -\frac{3}{2}$ ✓ (2)

3- $m = \frac{6-(-12)}{2.5-(-0.5)} = 6 \,/\, f_{(x)} = a(2x-1)^{-1} \Rightarrow f' = \frac{-2a}{(2x-1)^2} = 6$ (I)

$f_{(x)} = \frac{a}{2x-1} = 6x - 9$ (II) $\xrightarrow{I \cap II} x = 1 \Rightarrow a = -3 \Rightarrow f_{(5)} = -\frac{1}{3}$ ✓ (4)

4- $f' = 2 = \frac{(ax+1) - (ax+a^2)}{(ax+1)^2} = \frac{1-a^2}{(ax+1)^2} \xrightarrow{x=1} \frac{1-a}{a+1} = 2 \Rightarrow$ (2)

$2a + 2 = 1 - a \Rightarrow a = -\frac{1}{3}$ جایگذاری $\xrightarrow{x=1} (b=-1) \Rightarrow a - b = \frac{2}{3}$ ✓

5- $\frac{\sqrt{3}}{2}\sin = \sin + \frac{1}{2}\cos \Rightarrow \tan = 1 \Rightarrow x = \frac{\pi}{4}$

$f' = \cos x - \frac{1}{2}\sin x = \frac{\sqrt{2}}{4} \,/\, f_{(\frac{\pi}{4})} = \frac{3\sqrt{2}}{4} \,/\, y = \frac{\sqrt{2}}{4}x + \frac{3\sqrt{2}}{4} - \frac{\sqrt{2}\pi}{16}$ (2)

ریشه: $\frac{\sqrt{2}}{4}x + \frac{3\sqrt{2}}{4} - \frac{\sqrt{2}\pi}{16} = 0 \Rightarrow x = \frac{\pi}{4} - 3$ ✓

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۶- $f' = 6x^2 - 6x - 12 = 0 \Rightarrow x^2 - x - 2 = 0 \Rightarrow x < {2 \atop -1}$

$f_{(-1)} = 8 \;/\; f_{(2)} = -19 \;/\; m_{AB} = \frac{-27}{3} = -9 = f'$ (۲)

$6x^2 - 6x - 12 = -9 \Rightarrow 2x^2 - 2x - 1 = 0 \Rightarrow \Delta > 0 \Rightarrow$

۲ نقطه روی منحنی وجود دارد ✓

۷- $f' = 3kx^2 + 2(k+1)x \to f'' = 6kx + 2k + 2 = 0 \Rightarrow$

$\frac{-(2k+2)}{6k} < 0$ (−1, 0: − | + | −) $/ \; k < 0 \Rightarrow k < -1$ (I) $/ \; x = \frac{-(k+1)}{3k}$ (۲)

$f_{(x)} = k \times \left(\frac{-(k+1)}{3k}\right)^3 + \frac{(k+1)^3}{9k^2} = \frac{2(k+1)^3}{27k^2} > 0 \Rightarrow k > -1$ (II)

(I) $\cap$ (II) $\rightarrow \emptyset$ هیچ مقدار k نیست ✓

۸- نقطه عطف: $f'' = 6x + 2a = 0 \Rightarrow a = 3 \;/\; f_{(-1)} = a - b - 2 = -4 \Rightarrow$

$\Rightarrow b = 5 \Rightarrow \frac{a}{b} = \frac{3}{5}$ ✓ (۲)

۹- $f_{(0)} = 4 \Rightarrow c = 4 \quad f'_{(0)} = 0 \Rightarrow b = 0 \quad f'_{(x)} = 3x^2 + 2ax = 0 \Rightarrow$

$x(3x + 2a) = 0 \Rightarrow x = -\frac{2}{3}a \;/\; f_x = 0 \Rightarrow (-\frac{2}{3}a)^3 + a(-\frac{2}{3}a)^2 + 4 =$ (۲)

$-\frac{8}{27}a^3 + \frac{4}{9}a^3 + 4 = \frac{4}{27}a^3 + 4 = 0 \Rightarrow a = -3 \;/\; x_{min} = \frac{-2a}{3} = 2$ ✓

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۲

10- $f' = 4x^3 - 12x$ | $f''(x) = 12x^2 - 12$

$f'' = 0 \Rightarrow C\left|\begin{matrix}1\\0\end{matrix}\right. \quad D\left|\begin{matrix}-1\\0\end{matrix}\right.$ | $f'(x) = 4x(x+\sqrt{3})(x-\sqrt{3})$

	$-\sqrt{3}$		0		$\sqrt{3}$	
↘		↗		↘		↗

$A\left|\begin{matrix}\sqrt{3}\\-4\end{matrix}\right. \quad B\left|\begin{matrix}-\sqrt{3}\\-4\end{matrix}\right.$ | $m_{AB} = 0 \quad m_{CD} = 0 \Rightarrow$ زاویه بین این دو خط ۰

موازی اند