

$$f(0) = 0 \rightarrow \cos^2 0 + b = 0 \rightarrow 1 + b = 0 \rightarrow \boxed{b = -1}$$

$$f(x) = 4 \cos^2(x) (-\sin(x)) x + \alpha x \xrightarrow{\sin(x) = \frac{1}{\sqrt{2}}} \lim_{x \rightarrow 0} \frac{-4 \cos^2(x) x + \alpha x}{x}$$

$$= -4 \cos^2 0 + \alpha = -4 + \alpha = 4 \rightarrow \boxed{\alpha = 8} \rightarrow a + b = 8 - 1 = 7$$

$$f'(x) = 2x \rightarrow \left. \begin{array}{l} f(x) = 1 \rightarrow x = \frac{1}{\sqrt{2}} \rightarrow f\left(\frac{1}{\sqrt{2}}\right) = -\frac{3}{\sqrt{2}} \\ f(x) = -1 \rightarrow x = -\frac{1}{\sqrt{2}} \rightarrow f\left(-\frac{1}{\sqrt{2}}\right) = -\frac{3}{\sqrt{2}} \end{array} \right\} \oplus \rightarrow -\frac{3}{\sqrt{2}}$$

$$m = \frac{4 - (-12)}{\frac{1}{2} - (-\frac{1}{2})} = \frac{16}{1} = 16 \rightarrow y = 16x - 9$$

$$9 = 4\left(\frac{1}{2}\right) + b \rightarrow b = -9 \quad \Delta = 0 \quad \leftarrow \text{خط بر سر منتهی است}$$

$$f(x) = \frac{1}{x^2}$$

$$\frac{\Delta y}{\Delta x} = \frac{4 + 12}{\frac{1}{2} - (-\frac{1}{2})} = 16 \rightarrow f'(x) = 4 \rightarrow f(x) = \frac{-2\alpha}{(2x-1)^2} = 4 \rightarrow -12x^2 + 12x - 2 = \alpha$$

$$y = 16x - 9 \rightarrow 16x - 9 = \frac{\alpha}{2x-1} \rightarrow \alpha = 16x^2 - 2(16x - 9)$$

$$\frac{\alpha}{2x-1} = (16x - 9) \rightarrow 16x^2 - 16x + 9 - \alpha = 0 \rightarrow 16x^2 - 32x + 9 - \alpha = 0$$

$$\Delta = 0 \rightarrow (16)^2 - 4(16)(9 - \alpha) = 0 \rightarrow 256 - 576 + 64\alpha = 0 \rightarrow 64\alpha = 320 \rightarrow \alpha = 5$$

$$\left\{ \begin{array}{l} 16\alpha = -12x + 4 \\ \alpha = -4x + 2 \end{array} \right.$$

$$f'(1) = 2 \rightarrow f'(x) = \frac{(\alpha x + 1) - \alpha(x + \alpha)}{(\alpha x + 1)^2} = \frac{\alpha x + 1 - \alpha x - \alpha^2}{(\alpha x + 1)^2} = \frac{1 - \alpha^2}{(\alpha x + 1)^2}$$

$$f'(1) = \frac{1 - \alpha^2}{(\alpha + 1)^2} = 2 \rightarrow 2\alpha^2 + (\alpha + 1) = 1 - \alpha^2 \rightarrow 3\alpha^2 + (\alpha + 1) = 0 \rightarrow (\alpha + 1)(3\alpha + 1) = 0$$

$$f(1) = \frac{1 + \alpha}{\alpha + 1} = 1 = 2 + b \rightarrow \boxed{b = -1} \rightarrow a - b = \frac{1}{\sqrt{2}}$$

$$\sin x + \frac{1}{\sqrt{2}} \cos x = \frac{\sqrt{2}}{\sqrt{2}} \sin x \rightarrow \sin x - \cos x = \sqrt{2} \sin\left(x - \frac{\pi}{4}\right) = 0 \rightarrow x = \frac{\pi}{4}$$

$$f(x) = \cos x - \frac{1}{\sqrt{2}} \sin x \rightarrow f\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{\sqrt{2}} - \frac{\sqrt{2}}{\sqrt{2}} = 0$$

$$f\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{\sqrt{2}} + \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{\sqrt{2}}$$

$$\rightarrow \text{خط بر سر منتهی: } y = \frac{\sqrt{2}}{\sqrt{2}} x + \frac{\sqrt{2}(12 - \pi)}{14} = 0 \rightarrow x = \frac{\pi}{4} - 12$$

$$f'(1) = 4x^2 - 4x - 12 = 0 \rightarrow x^2 - x - 3 = 0 \rightarrow (x+1)(x-3) = 0 \rightarrow \begin{cases} x=3 \rightarrow f(3) = -19 \\ x=-1 \rightarrow f(-1) = 1 \end{cases}$$

$$\rightarrow \frac{f(3) - f(-1)}{3 - (-1)} = \frac{-19 - 1}{4} = -5 \rightarrow f'(x) = 4x^2 - 4x - 12 = -5 \rightarrow 4x^2 - 4x - 7 = 0$$

$$\rightarrow x = \frac{1 \pm \sqrt{1+7}}{2} = \frac{1 \pm \sqrt{8}}{2}$$

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$$f'(x) = 2kx^2 + 2(k+1)x \rightarrow f''(x) = 4kx + 2k + 2 = 0 \rightarrow 2kx + k + 1 = 0 \rightarrow x = \frac{-1-k}{2k}$$

k	-1	0
sign	-	+

E

↓
Min

$k = -1 \rightarrow x = -\frac{1}{2} \rightarrow f(-\frac{1}{2}) < 0 \rightarrow$ 2 ↘
K < 0

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$$f(-1) = -1 + a - b - 1 = a - b - 2 \rightarrow a - b = -2 \rightarrow a = b - 2$$

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

↙
Min

$\frac{a}{b} = \frac{1}{-1} = -1 \rightarrow a = -b$

$-2 = -1 + 1 - b - 1 \rightarrow b = 2$

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$$f(0) = c = 1 \quad f'(x) = 2x^2 + 2ax + b \rightarrow f'(0) = b = 0$$

$$f'(x) = 2x^2 + 2ax = 0 \rightarrow x(2x + 2a) = 0 \rightarrow \begin{cases} x=0 \\ x = -a \end{cases} \rightarrow \alpha = -\frac{2x}{2} = -x$$

$$f(x) = x^2 + ax + 1 = 0 \rightarrow \alpha = \frac{-1 - x^2}{x^2}$$

$$\rightarrow \frac{-1 - x^2}{x^2} = -\frac{2x}{2} \rightarrow x^2 - 1 = 0 \rightarrow x = 1 \rightarrow \alpha = -1$$

↙
Min

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$$f'(x) = 2x^2 - 12x = 0 \rightarrow x(2x - 12) = 0 \rightarrow \begin{cases} x=0 \\ x=6 \end{cases}$$

x	-√3	0	√3
f'	-	+	-
f	↘	↗	↘

↙
Min

$$f(\sqrt{3}) = 9 - 12\sqrt{3} + \Delta = -1 \quad f''(x) = 4x - 12 \rightarrow x = 3$$

$$f(-\sqrt{3}) = 9 - 12(-\sqrt{3}) + \Delta = -1 \quad f'(1) = 1 - 12 + \Delta = 0$$

$$f(-1) = 1 - 12 + \Delta = 0 \rightarrow CD \parallel AB \rightarrow 0 = \text{yali}$$

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