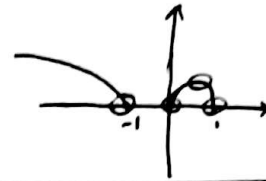


$f(x) = \sqrt{x(1-|x|)}$ $\rightarrow D_f: x(1-|x|) \geq 0$ $\rightarrow \begin{matrix} x_1 & -1 & 1 \\ | & + & - & + & - \\ \hline 0 & -1 & 0 & 1 & 0 \end{matrix}$ $\Rightarrow D_f = (-\infty, -1] \cup [0, 1]$

$x \rightarrow -\infty \Rightarrow y \rightarrow +\infty$

$m=1, n=0, k=4$

$\Rightarrow m+n+k=1+0+4=5$



1

$D_f: \begin{cases} x \geq 0 \\ a-2x \geq 0 \end{cases} \Rightarrow D_f = [0, \frac{a}{2}]$ $f'(x) = \frac{1}{2\sqrt{x}} + \frac{-1}{\sqrt{a-2x}} = 0 \Rightarrow \frac{1}{2\sqrt{x}} = \frac{1}{\sqrt{a-2x}}$ $\xrightarrow{\text{مربع کردن}} x = a-2x \Rightarrow a = \frac{a}{2}$

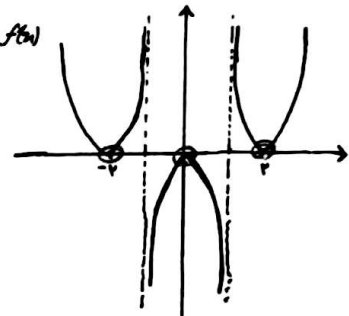
$c \mid \frac{a}{2} \rightarrow y_c = \sqrt{\frac{a}{2}} + \sqrt{\frac{2a}{2}} = \sqrt{\frac{a}{2}} + \sqrt{a} = 3\sqrt{\frac{a}{2}} = \sqrt{\frac{9a}{2}} = \sqrt{\frac{9a}{2}}$

$y_{\max} \cdot y_{\min} = \sqrt{12} \rightarrow \sqrt{\frac{9a}{2}} \cdot \sqrt{\frac{a}{2}} = \sqrt{12} \Rightarrow a = [a] = 4$

۲

$f(x) = \frac{x^2}{x^2-1} |x^2-1| \rightarrow$ $\begin{cases} x=0 \rightarrow \text{مضامبت} \\ x=\pm 1 \rightarrow \text{نقطه قطعی} \end{cases}$ \rightarrow $\begin{cases} x = \pm 1 \rightarrow \text{موجب تمام} \\ \text{انتقال ساده} \end{cases}$

$\lim_{x \rightarrow \pm\infty} f(x) \xrightarrow{\text{تقریب}} \frac{x^2}{a^2} |x^2| \rightarrow +\infty \rightarrow$ $\begin{cases} \text{نقطه مثبت} \\ \text{انتی} \end{cases}$ / $A(0,0) \in f(x)$



۳

$y = ax^3 + bx^2 + cx + d \rightarrow y' = 3ax^2 + 2bx + c$

$A(0,0) \rightarrow \begin{cases} a(0)^3 + b(0)^2 + c(0) + d = 0 \Rightarrow d=0 \\ 3a(0) + 2b(0) + c = 0 \Rightarrow c=0 \end{cases} \Rightarrow \begin{cases} y = ax^3 + bx^2 \\ y' = 3ax^2 + 2bx \end{cases}$ / $B(1,1) \rightarrow \begin{cases} a(1)^3 + b(1)^2 = 1 \Rightarrow a+b=1 \\ 3a(1) + 2b(1) = 0 \Rightarrow 3a+2b=0 \end{cases}$

$\Rightarrow \begin{cases} 3a+2b=0 \\ 3a+2b=0 \end{cases} \rightarrow a=-2, b=3 \quad | \quad \underline{ab = -6}$

۴

$f(x) = x|2-x| \quad [-1, \sqrt{3}] \xrightarrow{\text{تقریب}} f(x) = -x^2 + 2x \rightarrow f'(x) = -2x + 2 = 0$

$f(-1) = -\frac{9}{8} \quad f(\sqrt{3}) = 0 \Rightarrow \begin{cases} A(1, 2) \\ B(-1, -2) \end{cases} \rightarrow y_{\min} = \underline{-2}$ \leftarrow $\begin{matrix} \text{مطلق} \\ \text{منفی} \end{matrix}$

۵

$$y = x^2|x| + 3ax^2 + b \xrightarrow{a(-b)} y = -x^3 + 3ax^2 + b \rightarrow y' = -3x^2 + 6ax \xrightarrow{x=1} -3 - 6a = 0 \Rightarrow a = -\frac{1}{2}$$

$$\frac{b}{a} = \frac{-\frac{3}{2}}{-\frac{1}{2}} = 3 \quad \xrightarrow{x=1} 1 + 3a + b = 1 \xrightarrow{a=-\frac{1}{2}} b = \frac{3}{2}$$

4

$$(a+1)x + (a-1) = 0 \Rightarrow x = \frac{1-a}{a+1} \rightarrow \text{مجاوب قائم} \quad \left. \begin{array}{l} \\ \end{array} \right\} \text{عمل تقاطع: } A\left(\frac{-a+1}{a+1}, \frac{a}{a+1}\right)$$

$$\frac{a}{a+1} = y \rightarrow \text{مجاوب افقی}$$

$$y = \frac{3}{2}x^2 + x + \frac{3}{2} \rightarrow A\left(-\frac{1}{2}, \frac{3}{2}\right) \Rightarrow \frac{-a+1}{a+1} = -\frac{1}{2} \Rightarrow \frac{a-1}{a+1} = \frac{1}{2} \Rightarrow 2a-2 = a+1 \Rightarrow a=3$$

$$y = \frac{3a+3}{2a+1} = 0 \Rightarrow a = -\frac{3}{2}$$

5

$$y = \frac{bx^2 + 7}{4x^2 + ax + 1} \quad \text{مجاوب قائم} \rightarrow x = -\frac{1}{4} \Rightarrow 4\left(-\frac{1}{4}\right)^2 + a\left(-\frac{1}{4}\right) + 1 = 0 \rightarrow \frac{a}{4} = 2 \Rightarrow a = 8$$

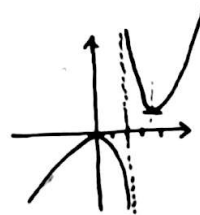
$$\text{مجاوب افقی} \rightarrow y = 7 \Rightarrow \lim_{x \rightarrow \pm\infty} y = \frac{b}{4} = 7 \Rightarrow b = 28 \quad \frac{b}{a} = \frac{28}{8} = 3.5$$

6

$$f(x) = \frac{x^4}{x^3 - 1}$$

$$x^4 = 0 \rightarrow \text{مضامین: } x = 0$$

$$x^3 - 1 = 0 \Rightarrow x = 1 \rightarrow \text{مجاوب قائم} \\ \text{انتقال سهم}$$



$$\lim_{x \rightarrow +\infty} f(x) = +\infty$$

$$\lim_{x \rightarrow -\infty} f(x) = -\infty$$

$$f'(x) = \frac{x^4 - 3x^2}{(x^3 - 1)^2} = 0 \Rightarrow x^2(x^2 - 3) = 0 \Rightarrow \begin{cases} x = 0 \\ x = \sqrt{3}, -\sqrt{3} \end{cases} \rightarrow 3 < \sqrt{3} < 4 \\ \hookrightarrow = 3, 17$$

9

بانهایی

$$\text{دانهای که در آن کجای نزولی است} : (0, 2) \cup (2, \sqrt{3}) \Rightarrow \text{مینیما: } \sqrt{3} - 2 \\ \text{از این دانه}$$

$$f(x) = \frac{x^4 - 3}{x^2 - 3}$$

$$x^4 - 3 = 0 \Rightarrow x = \sqrt[4]{3} \text{ (مینیما)}$$

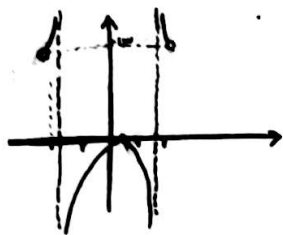
$$x^2 - 3 = 0 \Rightarrow x = \pm\sqrt{3} \text{ (مجاوب قائم)}$$

$$f(-\sqrt{3}) = 13$$

$$f(\sqrt{3}) = 13$$

- تابع f زوج -

$$\lim_{x \rightarrow \pm\infty} f(x) = +\infty$$



بازدهایی که در آن کجای نزولی است

$$\Rightarrow \text{دانهای که در آن کجای نزولی است} : (\sqrt[4]{3}, \sqrt{3}) \cup (\sqrt{3}, 2)$$

$$\rightarrow \text{دانه باز}$$

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