

$$f(x) = (x+1)^2 + (3x-1)^2 + mx^2 + nx + mn \rightarrow \text{تابع ثابت} \quad (1)$$

$$\Rightarrow f(x) = x^2 + 2x + 1 + 9x^2 - 6x + 1 + mx^2 + nx + mn$$

$$\Rightarrow f(x) = (10+m)x^2 + (n-4)x + mn + 2 \quad \begin{cases} 10+m=0 \Rightarrow m=-10 \\ n-4=0 \Rightarrow n=4 \end{cases}$$

$$g(x) = \{(f, m), (n, p+1), (p+2, -1), (-9, p+k)\} \\ (f, -10), (4, p+1) \Rightarrow p+1 = -10 \Rightarrow p = -11$$

$$\Rightarrow (p+2, -1) = (-9, -1) \Rightarrow (-9, -1) = (-9, p+k) = (-9, k-11) \Rightarrow k-11 = -1 \Rightarrow k = 10$$

$$\Rightarrow m+n+p+k = (-10) + 4 + (-11) + 10 = -7$$

$$(الف) y = \frac{x-2}{x^2-2x^2-8} \Rightarrow \frac{x-2}{x^2-2x^2-8} \geq 0 \quad (2)$$

$$\Rightarrow \frac{x-2}{(x^2-4)(x^2+2)} \geq 0 \Rightarrow \frac{x-2}{(x-2)(x+2)(x^2+2)} \geq 0 \rightarrow \frac{-2}{\underbrace{+}_{\text{ج}} \underbrace{+}_{\text{ج}}}$$

$$\Rightarrow \text{دامنه تابع} = (-2, 2) \cup (2, +\infty) \setminus \{-2\}$$

$$(ب) f(x) = \frac{2x^2+1}{x-2[-x]} \Rightarrow x-2[-x] \neq 0 \Rightarrow -2[-x] \neq -x \Rightarrow [-x] \neq x \\ \Rightarrow -x \notin [2, 3] \Rightarrow x \notin (-3, -2]$$

$$\Rightarrow D_f = \mathbb{R} - (-3, -2]$$

(الف) $f(x) = \frac{\sqrt{x(x^2-1)}}{\sqrt{|x|+x}} \Rightarrow x(x^2-1) \geq 0 \Rightarrow \overset{0}{\uparrow} x(\overset{1}{\uparrow} x-1)(\overset{-1}{\uparrow} x+1) \geq 0$ (۳)

$\Rightarrow |x|+x > 0 \Rightarrow |x| > -x \Rightarrow x \in \mathbb{R}^+ \setminus (0, +\infty)$ (۲)

$\Rightarrow D_f = \textcircled{1} \cap \textcircled{2} = [1, +\infty)$

(ب) $f(x) = \frac{\sqrt{|x-2|-x^2}}{|x|-1} \Rightarrow |x-2|-x^2 \geq 0$

$x \geq 2 \rightarrow -x^2+x-2 \geq 0 \Rightarrow a < 0$ و $\Delta < 0 \Rightarrow$ این عبارت همیشه منفی است و max ندارد.

$x < 2 \rightarrow 2-x-x^2 \geq 0 \Rightarrow x^2+x-2 \leq 0 \Rightarrow (x+2)(x-1) \leq 0 \Rightarrow \frac{-2}{+} \frac{1}{-} +$

$\textcircled{A} x \in [-2, 1]$ (۱)

$\textcircled{B} x \in [-2, 1]$ (۲)

$\Rightarrow |x|-1 \neq 0 \Rightarrow |x| \neq 1 \Rightarrow x \neq \pm 1$ (۳) $\Rightarrow D_f = \textcircled{1} \cap \textcircled{2} = [-2, 1] - \{-1\}$

$y = \frac{1}{||x-2|-1|-k} \Rightarrow ||x-2|-1|-k \neq 0 \Rightarrow ||x-2|-1| \neq k$ (۴)

$\Rightarrow |x-2|-1 \neq \pm k \Rightarrow |x-2| \neq 1 \pm k$

$\Rightarrow |x-2| \neq 1+k \Rightarrow x-2 \neq 1+k \Rightarrow x \neq 3+k$

$\Rightarrow |x-2| \neq 1+k \Rightarrow x-2 \neq -(1+k) \Rightarrow x \neq 1-k$

$\Rightarrow |x-2| \neq 1-k \Rightarrow x-2 \neq 1-k \Rightarrow x \neq 3-k$

$\Rightarrow |x-2| \neq 1-k \Rightarrow x-2 \neq -(1-k) \Rightarrow x \neq 1+k$

چون دامنه تابع شامل سه مقدار است (۳) $k \neq 0$ است

۲ عبارت از این ۴ عبارت با هم برابرند (۲ حالت خارج)

$\textcircled{A} \textcircled{B} \Rightarrow$

$\Rightarrow 3+k = 1-k \Rightarrow k = -1$

$\Rightarrow 1+k = 3-k \Rightarrow k = 1$

$\Rightarrow x \neq 0$ و $x \neq 2 \Rightarrow \frac{1}{||x-2|-1|} = 1$

می شود و معجزه برابر می شود با $1-k \neq 0 \Rightarrow k \neq 1$

$\boxed{k = -1}$ $\Rightarrow k \neq 1$

$$y = rx - [n]$$

(٥)

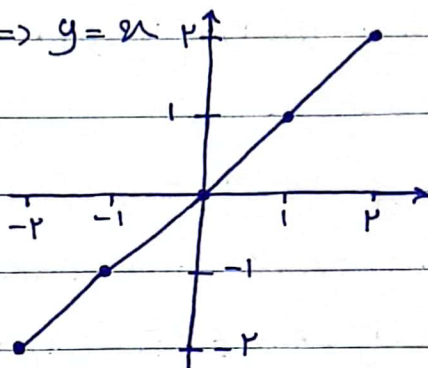
$$\Rightarrow x \in [-r, -1) \rightarrow y \in [-r, -1)$$

$$x \in [-1, 0) \rightarrow y \in [-1, 0)$$

$$x \in [0, 1) \rightarrow y \in [0, 1)$$

$$x \in [1, r) \rightarrow y \in [1, r)$$

$$x = r \rightarrow y = r$$



$$f(x) = \frac{x^r - rx + r}{x+a} + b = \frac{(x-1)(x-r)}{x+a} + b \rightarrow \text{تابع هانس} \quad (٤)$$

$$(1) \quad x+a = x-1$$

$$\Rightarrow a = -1$$

$$\Rightarrow y = x - r + b$$

$$(2) \quad x+a = x-r$$

$$\Rightarrow a = -r$$

$$\Rightarrow y = x - 1 + b \xrightarrow{y=x} b = 1$$

$$\leftarrow y = x$$

$$y = x \rightarrow b = r \Rightarrow a - b = -1 - r = -f \quad \vee \quad a - b = -r - 1 = -f$$

$$\Rightarrow \underline{a - b = -f} \rightarrow \text{نقطة دار}$$

$$f(x) = \begin{cases} \frac{x^r + rx^r - x - r}{x^r - 1} ; x \neq \pm 1 \\ \frac{ax + r}{x+b} ; x = \pm 1 \end{cases}$$

$$g(x) = x + C$$

$$x^r + rx^r - x - r = x^r(x+r) - (x+r) = (x^r - 1)(x+r)$$

$$x \neq \pm 1 \rightarrow \frac{x^r + rx^r - x - r}{x^r - 1} = \frac{(x+r)(x^r - 1)}{x^r - 1} = x + C \Rightarrow x + r = x + C \Rightarrow C = r$$

$$x = \pm 1 \rightarrow x + C = x + r = \frac{ax + r}{x+b} \xrightarrow{x=1} r = \frac{a+r}{1+b} \Rightarrow a - rb = 1$$

$$\xrightarrow{x=-1} 1 = \frac{r-a}{b-1} \Rightarrow a+b=r \Rightarrow \begin{cases} a - rb = 1 \\ a+b=r \end{cases} \Rightarrow \begin{cases} -a+rb = -1 \\ a+b=r \end{cases}$$

$$\Rightarrow b+C = \frac{1}{r} + r = \frac{a}{r}$$

$$rb = r \Rightarrow b = \frac{1}{r}$$

$$f(x) = \sqrt{fx - xa} + k - 1 \quad g(x) = \sqrt{b - fx} + 3k \quad (A)$$

$\hookrightarrow x \geq \frac{xa}{f} \quad (1)$
 $\hookrightarrow x \leq \frac{b}{f} \quad (2)$

$D_{f-g} = (1) \cap (2) = \left[\frac{xa}{f}, +\infty\right) \cap \left(-\infty, \frac{b}{f}\right] \Rightarrow x = 1$

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 تا عضو {1} است

$xa = b = f \quad \hookrightarrow \frac{xa}{f} = \frac{b}{f} = 1$

$x = 1 \rightarrow 2f - g = k \Rightarrow 2\sqrt{f-f} + 2k - 2 - \sqrt{f-f} - 3k = k$

$\Rightarrow 2k - 2 - 3k = k \Rightarrow -k - 2 = k \Rightarrow 2k = -2 \Rightarrow k = -1$

$\Rightarrow xa - \frac{b}{f} - k = f - \frac{f}{f} - (-1) = f - 1 + 1 = \underline{f}$

$f(x) = \sqrt{m - x} + n \quad g(x) = \sqrt{px + p} \Rightarrow 2n + 2 > 0 \Rightarrow n > -1$
(9)

$\hookrightarrow x \leq m \quad (1)$
 $\hookrightarrow x \geq -1 \quad (2)$

$\Rightarrow D_{f-g} = (1) \cap (2) = (-\infty, m] \cap [-1, +\infty) = [-1, m] \Rightarrow [-1, m] = [-1, 7]$

$\Rightarrow m = 7 \Rightarrow f - g(7) = \sqrt{7 - 7} + n - \sqrt{7} = 4\sqrt{7}$

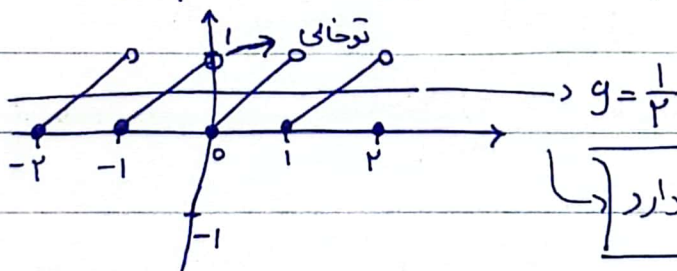
$\Rightarrow 2 + n - 2\sqrt{7} = 4\sqrt{7} \Rightarrow 2 + n = 6\sqrt{7} \Rightarrow n = 6\sqrt{7} - 2$

$\Rightarrow m + n = 7 + 6\sqrt{7} - 2 = \underline{5 + 6\sqrt{7}}$

$y = (-1)^p (x - [x]) = \frac{1}{p} \quad x \in [-2, 2] \quad (1a)$

$y = x - [x] = \frac{1}{p} \rightarrow$ بار غدار $x - [x]$ بار $y = \frac{1}{p}$

قطع می‌اند.



صفت غدار: جواب دارد