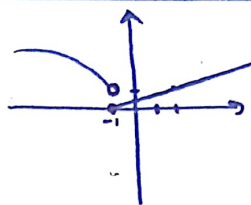


$$x \begin{cases} 3y-1 & y \geq 0 \rightarrow 3y-1=x \rightarrow \frac{x+1}{3} \\ -y^2 & y < 0 \rightarrow x=-y^2 \rightarrow \sqrt{-x}=y \end{cases}$$



تابع است

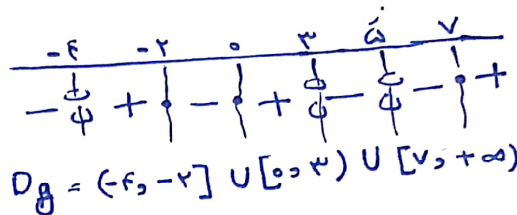
سوال (۱)

$$g(x) = \sqrt{\frac{x f(x-2)}{f(x)}}$$

$$\frac{x f(x-2)}{f(x)} \geq 0$$

$f(x)$ ریشه های $\rightarrow -4, 3, 5$

$f(x-2)$ ریشه های $\rightarrow -2, 5, 7$



$$D_g = (-\infty, -4] \cup [0, 3) \cup [7, +\infty)$$

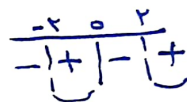
سوال (۲)

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

$$x^3 - 4x = 0 \rightarrow x(x^2 - 4) = 0 \rightarrow x = 0, -2, 2$$

الف) $D_f = \mathbb{R} - \{\text{ریشه های } f\} \rightarrow D_f = \mathbb{R} - \{-2, 0, 2\}$

ب) $\sqrt{\frac{x^2 - 3x + 2}{x^3 - 4x}} \geq 0 \rightarrow \frac{x^2 - 3x + 2}{x^3 - 4x} \geq 0 \rightarrow x^3 - 4x > 0$

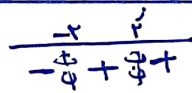


$$D = (-\infty, -2) \cup (2, +\infty)$$

سوال (۳)

الف) $\sqrt{\frac{x-2}{x^4 - 2x^2 - 1}}$

$$\frac{x-2}{x^4 - 2x^2 - 1} \geq 0$$



$$D_y = (-\infty, -2) \cup (2, +\infty)$$

سوال (۴)

$$x^4 - 2x^2 - 1 = 0$$

$$t^2 - 2t - 1 = 0 \quad (t-4)(t+2) = 0 \rightarrow t = -2 \text{ و } 4$$

$$t = -2 \text{ و } 4$$

$$t = 4 = x^2 \rightarrow x = \pm 2$$

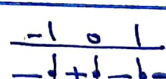
ب) $y = \frac{2x^2 + 1}{4 - x[-x]}$

$$D_y = \mathbb{R} - \{\text{ریشه های } f\} \rightarrow \mathbb{R} - \{-4, -2\} \rightarrow D_f = (-\infty, -4) \cup (-2, +\infty)$$

$$4 - x[-x] = 0 \rightarrow 4 + x^2 = 0 \rightarrow x^2 = -4 \rightarrow x = \pm 2i$$

الف) $f(x) = \frac{\sqrt{x(x^2-1)}}{\sqrt{|x|+x}}$

$$\frac{x(x^2-1)}{|x|+x} \geq 0$$



$$[-1, 0] \cup [1, +\infty)$$

سوال (۵)

$$\sqrt{|x|+x} \rightarrow |x|+x > 0$$

$$|x|+x > 0 \rightarrow |x| > -x \rightarrow (0, +\infty)$$

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

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

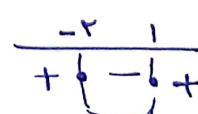
$$|x-2| - x^2 \geq 0 \rightarrow |x-2| \geq x^2$$

$$x-2 \geq x^2 \rightarrow x^2 - x + 2 \leq 0$$

$$x-2 \leq -x^2 \rightarrow x^2 + x - 2 \leq 0$$

$$x = 1, 2$$

$$\text{②} [-2, 1]$$



$$|x|-1 \neq 0 \rightarrow |x| \neq 1 \rightarrow x \neq \pm 1$$

① ② $D_f = [-2, -1) \cup (-1, 1)$

$$y = \sqrt{(x-2)(x-3)} \rightarrow (x-2)(x-3) \geq 0$$

$$[x-2] = 0 \rightarrow 0 \leq x-2 < 1 \rightarrow 2 \leq x < 3$$

$$[x-3] = 0 \rightarrow 0 \leq x-3 < 1 \rightarrow 3 \leq x < 4$$

$$D_f = \mathbb{R}$$

$$y = \sqrt{|x-1|(x-3)} \rightarrow |x-1|(x-3) \geq 0$$

$$[x-3] = 0 \rightarrow 0 \leq x-3 < 1 \rightarrow 3 \leq x < 4$$

$$D_f = [3, +\infty) \cup \{1\}$$

$$g = \frac{1}{|x-2|-1} - k \rightarrow D = \mathbb{R} - \{\text{ریشه مخرج}\} \rightarrow \mathbb{R} - \{0, 2, 4\}$$

باید از مخرج صفر نشود $\rightarrow k \geq 0$

$$|x-2|-1 = k \rightarrow |x-2| = k+1$$

$$|x-2|-1 = -k \rightarrow |x-2| = 1-k$$

$$x = k+3 \rightarrow 4$$

$$x = -k+1 \rightarrow 0$$

$$x = 3-k \rightarrow 2$$

$$x = k+1 \rightarrow 2$$

چون دامنه تنها شامل 3 عدد نیست پس دوتا از شاخه ها باید باهم برابر باشند

$$k+3 = 3-k \rightarrow k = 0$$

$$k+1 = -k+1 \rightarrow k = 0$$

کافی تواند صفر باشد چون در آن صورت دامنه تنها شامل 2 عدد نمی شود

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

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

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

$$\rightarrow k+1 = k+3 \rightarrow 1 = 3$$

$$D = \mathbb{R} - \{\text{ریشه مخرج}\}$$

$$f(x) = \frac{x^2+3x+2}{(x^2+3x+2)(x+1)(x-1)}$$

$$\textcircled{1} x-1 \neq 0 \rightarrow x \neq 1$$

$$\textcircled{2} \frac{x+1}{x-1} \neq 0 \rightarrow x \neq -1$$

$$\textcircled{3} x^2+3x+2 \neq 0 \rightarrow x \neq -1, -2$$

$$n = 3$$

$$x^2 - 2nx + 3n = 0 \rightarrow x^2 - 4x + 9 = 0 \rightarrow (x-3)^2 = 0 \rightarrow \text{یک جواب } x = 3$$

$$y = \log_{n+1} \log_n \frac{x}{x+1}$$

$$x+1 > 0 \rightarrow x > -1$$

$$x+1 \neq 1 \rightarrow x \neq 0$$

$$\frac{x}{x+1} > 0 \rightarrow x > 0$$

$$-1 \log_n^2 > 0 \rightarrow \log_n^2 < 0 \rightarrow 0 < x < 1$$

$$D_f = \textcircled{1} \cap \textcircled{2} \cap \textcircled{3} \Rightarrow (0, 1)$$

$$-5 \leq 3x^2 - 1 \leq 3 \rightarrow -1 \leq 3x^2 - 1 \leq 3 \rightarrow 0 \leq 3x^2 \leq 4 \rightarrow 0 \leq x^2 \leq \frac{4}{3}$$

به چپن کمترین مقدار $3x^2$ مساوی صفر است پس کمترین مقدار $3x^2 - 1$ برابر -1 است

$$\rightarrow \frac{-2}{\sqrt{3}} \leq x \leq \frac{2}{\sqrt{3}}$$

$$D = \left[\frac{-2}{\sqrt{3}}, \frac{2}{\sqrt{3}} \right]$$