

$$f(x) = \left(\frac{1}{x}\right)^{x-2} \quad \begin{cases} x^3 f(x+1) \geq 0 \\ f(x+1) = \left(\frac{1}{x}\right)^{x-1} \end{cases}$$

شماره ۱
x=1

$$D_f = [0, +\infty) \quad D_f = [0, 1]$$

(1,0)

$$f(-x) = \sqrt{-x + |x-1|}$$

$$f(-x) = \begin{cases} \sqrt{-x} & x \geq 1 \\ \sqrt{-2x+2} & x < 1 \end{cases} \Rightarrow D_f = (-\infty, 1]$$

شماره ۲
-2x+2 ≥ 0
2x ≤ 2
x ≤ 1

(5)

$$\frac{x-1}{f(x)} \geq 0 \quad \begin{matrix} -5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 \\ | & - & + & - & + & - & + & - & + \end{matrix}$$

شماره ۳
-5, -4, -3, -2, -1, 0, 1, 2, 3

$$D_f = (-5, 1] \cup (2, 3)$$

(5)

$$y_1 = \frac{1}{9x^5 - 7x^3 - 4x - 3} \neq 0$$

$$(9x^5 - 7x^3 + 1) - (x^3 + 2x + 2) = 0$$

$$(3x^2 - x - 3)(3x^2 + x + 1) = 0$$

شماره ۴
Δ < 0

$$3x^2 + ax + b = 3x^2 - x - 3$$

$$a = -1$$

$$b = -3$$

$$\sqrt{-(a+b)} = \sqrt{-(-4)} = 2$$

(5)

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

$$x^4 + x^4 - 4x^2 - 4x = t^3 + t^2 - 4t - 4 = (t-2)(t^2 + 2t + 4)$$

$$\sqrt{f(x) - f\left(\frac{x}{x}\right)} \geq 0$$

$$\begin{matrix} -2 & 0 & 2 \\ | & - & + & - & + \\ - & 0 & 2 & - & 2 & + \end{matrix}$$

$$D_f = [-2, 0) \cup [2, +\infty)$$

(5)

$x^3 + x = 2 \rightarrow x = 1 \Rightarrow f(2) = 2 - 1 = 1$ $x^3 + x = 10 \rightarrow x = 3 \Rightarrow f(10) = 10 - 1 = 9$ $f(2) + f(10) = 1 + 9 = 10$	6
$f(x) = x^3 - 4x^2 + 12x - 8 + 8 = (x-2)^3 + 8$ $g(x) = x^3 + 9x^2 + 27x + 27 - 27 = (x+3)^3 - 27$ $\frac{g(\sqrt[3]{27}-3)}{f(\sqrt[3]{27}+2)} = \frac{(\sqrt[3]{27}-3+3)^3-27}{(\sqrt[3]{27}+2-2)^3+8} = \frac{27-27}{8+8} = -\frac{1}{2}$	7
$f(x) + g(x) = \sqrt{(x-2)+2}\sqrt{x-2}+2 + \sqrt{(x-2)-2}\sqrt{x-2}+2 = \sqrt{(x-2)+2} + \sqrt{(x-2)-2}$ $= \sqrt{x-2}+2 + \sqrt{x-2}-2 \xrightarrow{x \geq 2} 2\sqrt{x-2} = a+b\sqrt{x+c}$ $\left. \begin{array}{l} a+b=2 \\ c=-2 \end{array} \right\} \frac{a+b}{c} = -\frac{1}{2}$	8
$f(2) = -4$ $f(1) = \text{تعریف نشده}$ $f(3) = \text{تعریف نشده}$ $f(0) = \frac{2}{3}$ $\frac{g}{f} = \left\{ \left(2, -\frac{1}{2}\right), \left(0, \frac{2}{3}\right) \right\}$	9
الف) $f(2x) = \left\{ \left(\frac{1}{2}, 2\right), \left(\frac{3}{2}, -1\right), (2, 2), \left(-\frac{1}{2}, 4\right) \right\}$ ب) $f(x^2) = \left\{ (1, 2), (\sqrt{3}, -1), (2, 2) \right\}$ ج) $2g^2(x)+1 = \left\{ (-2, 19), (1, 3), (3, 9), (-1, 1) \right\}$ د) $\frac{2f}{g} = \left\{ (1, -4), (3, -1), \left(-1, \frac{11}{2}\right) \right\}$	10

ب) $\left\{ \begin{array}{l} x^2 = 1 \rightarrow x = \pm 1 \\ x^2 = 3 \rightarrow x = \pm \sqrt{3} \\ x^2 = 4 \rightarrow x = \pm 2 \\ x^2 = -1 \rightarrow x \end{array} \right. \rightarrow \left\{ (\pm 1, 2), (\pm \sqrt{3}, -1), (\pm 2, 2) \right\}$