

$$xf(x) \geq 0$$

	-۵	-۱	۰	۲	۵
x	⊖	-	-	+	+
f(x)	+	+	-	-	+
P	⊖	+	+	+	+

$$\rightarrow D_f = [-5, 0] \cup [2, 5]$$

نقطه‌های شکست در بازه $[-5, 5]$ بررسی می‌شود.

۱

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

	-۴	-۲	۰	۲	۵
-x	+	+	+	-	-
f(x)	⊖	⊖	⊖	⊖	⊖
P	⊖	⊖	⊖	⊖	⊖

$$\rightarrow -4, -1, 1 \rightarrow 3$$

۲

$$x=2 \rightarrow f(2) - 2f(2) = 4 - 4 + 2 \rightarrow -f(2) = 2 \rightarrow f(2) = -2$$

$$x=-2 \rightarrow f(-2) - 2f(2) = (-1) + 4 + 2 \rightarrow f(-2) = 10$$

۳

$$f(f(5)) + f(f(1)) = 7 + 2 = 9$$

$$\begin{cases} f(5) \Rightarrow 5 - \sqrt{4} = 2 & f(2) \Rightarrow 2 + 2 = 4 \\ f(1) = 5 & f(5) = 5 - \sqrt{4} = 2 \end{cases}$$

۴

$$f(x) = ax^2 - bx + 1 =$$

$$a(x-1)^2 - b(x-1) + 1 = ax^2 + bx - 1 \rightarrow ax^2 - 2ax + a - bx + b + 1 - ax + bx - 1 =$$

$$\frac{-2ax + a + b}{2x} = 4x + 1 \rightarrow -2ax = 4x \rightarrow a = -2$$

$$\rightarrow -2 + b = 1 \rightarrow b = 3$$

$$\Rightarrow a - b = -2 - 3 = -5$$

۵

$$f(\sqrt{r}-r) = \frac{(\sqrt{r}-r)^r + r(\sqrt{r}-r) + \omega}{(\sqrt{r}-r)^r + r(\sqrt{r}-r) + v} = \frac{r - \cancel{r\sqrt{r}} + r + \cancel{r\sqrt{r}} - r + \omega}{r - \cancel{r\sqrt{r}} + r + \cancel{r\sqrt{r}} - r + v} = \frac{r}{r} = \boxed{\frac{r}{r}}$$

6

$$f\left(x - \frac{1}{x}\right) = \frac{x^r}{x^r} + \frac{1}{x^r} \sim x^r + \frac{1}{x^r} \rightarrow \left(x - \frac{1}{x}\right)^r + r \sim f(x) = x^r + r$$

$\underbrace{x^r - r + \frac{1}{x^r}}_{x^r - r + \frac{1}{x^r}}$

$$f(-r) = (-r)^r + r = 9 + r = 11$$

7

$$f(x) = \{(r, 0), (1, -r), (0, r), (v, 1)\}$$

$$g(x) = \sqrt{4-x^2} \sim 4-x^2 \geq 0 \rightarrow [-2, 2]$$

$$\rightarrow D_{f \cap g} = \{0, 1, 2\}$$

$$g(x) = \{(-2, 0), (-1, \sqrt{3}), (-1, \sqrt{3}), (0, 2), (1, \sqrt{3}), (1, \sqrt{3}), (2, 0)\}$$

8

$$\text{الف) } \frac{f}{g} = \left\{ (r, 0), \left(1, \frac{-r}{\sqrt{4}}\right), \left(2, \frac{r}{r}\right) \right\}$$

$\downarrow$
 $\left(1, \frac{-r}{\sqrt{r}}\right)$

$$\rightarrow \frac{g}{f} = \left\{ \left(0, \frac{r}{r}\right), \left(1, \frac{\sqrt{4}}{-r}\right), \left(1, \frac{\sqrt{r}}{-r}\right) \right\}$$

$$\text{ب) } r f(x) \sim \{(r, r), (r, 1), (-\omega, r), (1, -r)\}$$

$$\rightarrow f(x) + 1 \sim \{(r, r), (r, 1), (-\omega, r), (1, -1)\}$$

$$\text{ج) } r f'(x) + 1 \sim \{(r, r), (r, r), (-\omega, r), (1, r)\}$$

$$\rightarrow f(rx) \sim \left\{ \left(1, 1\right), \left(\frac{r}{r}, r\right), \left(\frac{-\omega}{r}, r\right), \left(\frac{1}{r}, -r\right) \right\}$$

9

$$\text{الف) } f - g = \{(1, r), (r, r), (r, r)\}$$

$$g \rightarrow (1, 0), (r, 1), (r, -1)$$

$$f \rightarrow (1, r), (r, r), (r, 1)$$

$$\rightarrow \frac{rf}{g} = \{(r, r), (r, -r)\}$$

10